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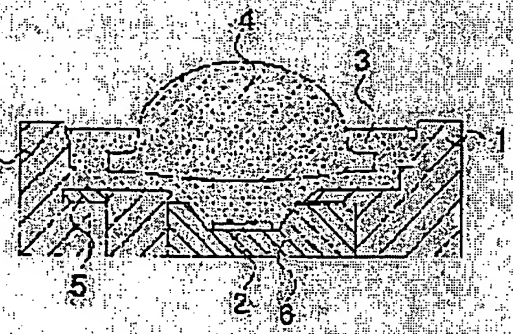
## (54) LIGHT EMITTING DEVICE AND ITS FORMING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a light emitting device in which reliability can be enhanced without sacrifice of optical characteristics.

SOLUTION: The light emitting device comprises a light emitting element chip, a translucent flexible member covering the light emitting element chip, and a translucent rigid member being placed above the flexible member. The translucent member has a major surface and a back surface projecting in the direction of the light emitting element. Since the shape of the rigid member is specified, mixing of bubble can be controlled at the interface of the flexible member and the rigid member and a highly reliable light emitting device adaptable to reflow packaging and Pb free packaging can be attained.

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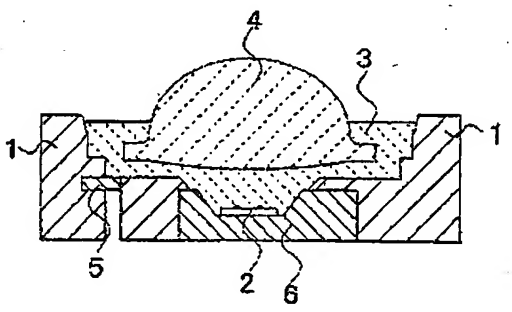
ＤＡ４４　ＤＡ４５　ＤＡ５７　ＤＡ５８　ＤＢ０９
ＥＥ２５　ＦＦ１１

(54)【発明の名称】　発光装置とその形成方法

(57)【要約】
【課題】光学特性を劣化することなく信頼性を高めることが可能な発光装置を提供する。
【解決手段】発光素子チップと、該発光素子チップを被覆する透光性柔軟部材と、該柔軟性部材の上方に載置される透光性剛性部材と、を有する発光装置であって、前記透光性部材は主面と背面を有し、前記背面は前記発光素子方向へ突出していることを特徴とする。このように剛性部材の形状を特定することにより、柔軟性部材と剛性部材との界面における気泡混入を抑制することができ、リフロー実装およびＰｂフリー実装にも対応することが可能な高い信頼性を有する発光装置が得られる。



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【特許請求の範囲】

【請求項１】 発光素子チップと、該発光素子チップを被覆する透光性柔軟部材と、該柔軟性部材の上方に載置される透光性剛性部材と、を有する発光装置であって、前記透光性部材は主面と背面を有し、前記背面は前記発光素子方向へ突出していることを特徴とする発光装置。

【請求項２】 前記背面は、一点にて前記発光素子チップと最近接していることを特徴とする請求項１記載の発光装置。

【請求項３】 前記背面は、曲面を有することを特徴とする請求項１記載の発光装置。

【請求項４】 前記背面は、凸形状であることを特徴とする請求項１記載の発光装置。

【請求項５】 前記剛性部材の下端は、外側へ広がる鍔部を有し、該鍔部の側面及び主面は前記柔軟性部材にて被覆されていることを特徴とする請求項１記載の発光装置。

【請求項６】 表面に設けられた凹部内に発光素子チップを収納するパッケージと、少なくとも前記凹部を被覆し透光性を有する柔軟性部材と、該柔軟性部材の上方に載置され透光性を有する剛性部材、とを有する発光装置であって、

前記パッケージは、少なくとも前記第一の凹部上方にて少なくとも外側へ向かって広がる第一の主面と、該第一の主面より上方にて外側へ広がる第二の主面と、該第二の主面より上方にて外側へ広がりパッケージの外部となる第三主面とを有し、

前記剛性部材は、前記第二の主面の外郭内に少なくとも３以上の接点を有して内接しており、

前記第一の主面および前記第二の主面は、それぞれ前記剛性部材の各接点間外部に露出部を有し、

前記柔軟性部材は、前記第一の主面、前記第二の主面、および前記剛性部材の下端部に渡り連続的に設けられていることを特徴とする発光装置。

【請求項７】 前記第二の主面は、前記第一の主面、および前記剛性部材の下端部に渡り連続的に設けられていることを特徴とする請求項１記載の発光装置。

【請求項８】 前記剛性部材は、前記第二の主面の外郭内に少なくとも３以上の接点を有して内接しており、前記第一の主面および前記第二の主面は、それぞれ前記剛性部材の各接点間外部に露出部を有することを特徴とする請求項６記載の発光装置。

【請求項９】 前記剛性部材の下端は、外側へ広がる鍔部を有し、該鍔部の側面及び主面は前記柔軟性部材にて被覆されていることを特徴とする請求項６記載の発光装置。

【請求項１０】 前記鍔部の背面は、前記第二の主面と平行で且つ対向していることを特徴とする請求項９記載の発光装置。

【請求項１１】 前記第二の主面の外郭は、前記剛性部材の外郭より多くの角を有する多角形であることを特徴とする請求項８記載の発光装置。

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【請求項１２】 前記剛性部材の外郭は、前記接点においてＲを帯びていることを特徴とする請求項１１記載の発光装置。

【請求項１３】 前記第一の主面において、前記露出部は、中央領域より外側へ突出した凸部であることを特徴とする請求項８記載の発光装置。

【請求項１４】 前記第一の主面において、前記露出部は、前記第二の主面の角と対向していることを特徴とする請求項８記載の発光装置。

【請求項１５】 前記第一の主面において、前記露出部先端の外郭は、Ｒを帯びていることを特徴とする請求項８記載の発光装置。

【請求項１６】 前記パッケージは、側面より一対のリード電極が挿入され成形樹脂にて一体成形されたものであり、前記リード電極のインナー部は、前記第一の主面において該第一の主面の外郭に沿って露出されていることを特徴とする請求項６記載の発光装置。

【請求項１７】 前記リード電極のインナー部は、前記第一の主面の露出部からから内側の二方向へ分離していることを特徴とする請求項１６記載の発光装置。

【請求項１８】 前記リード電極のインナー部は、背面の一部がパッケージ背面側から貫通した微小孔より露出していることを特徴とする請求項１６記載の発光装置。

【請求項１９】 前記パッケージは、背面が実装面となる金属基体を有し、該金属基体の主面は前記凹部底面から露出され前記発光素子が載置されていることを特徴とする請求項６記載の発光装置。

【請求項２０】 前記金属基体は、側面方向より挿入され前記成形樹脂にて前記リード電極と共に一体成形されていることを特徴とする請求項１９記載の発光装置。

【請求項２１】 前記金属基体は、前記凹部から露出される第一の主面と、前記パッケージ中に埋没する第二の主面とを有することを特徴とする請求項１９乃至１６記載の発光装置。

【請求項２２】 前記金属基体は、前記凹部底面から金属基体の主面の中央部に第二の凹部を有することを特徴とする請求項１９記載の発光装置。

【請求項２３】 前記一対のリード電極の一端部は、前記金属基体の一端部が露出された側面と反対側の側面より所定の距離を隔てて並列に露出していることを特徴とする請求項１９記載の発光装置。

【請求項２４】 前記パッケージの背面は、上記金属基体と対向する側面側に開口した切欠部を有することを特徴とする請求項１９記載の発光装置。

【請求項２５】 前記発光素子は、同一平面側に正負一対の電極を有し、該正負一対の電極は、それぞれ前記一対のリード電極のインナー部と架橋したワイヤを有し、該ワイヤの頂点は、前記第一主面と前記第二の主面の間

に配置されていることを特徴とする請求項６記載の発光装置。

【請求項２６】 前記柔軟性部材は、蛍光物質が含有されていることを特徴とする請求項１記載の発光装置。

【請求項２７】 前記柔軟性部材は、少なくとも２つ以上の層からなる積層構造を有し、前記蛍光物質は少なくとも１層に含有されていることを特徴とする請求項２６記載の発光装置。

【請求項２８】 表面に設けられた凹部内に発光素子チップを収納するパッケージと、少なくとも前記凹部を被覆し透光性柔軟部材と、該柔軟性部材の上方に載置され透光性を有する剛性部材とを有し、前記パッケージの底面から上方まで一貫した通路を備えた発光装置の形成方法であって、表面に凹部を有するパッケージ内に前記発光素子を覆うように前記透光性柔軟部材を注入する第一の工程と、前記透光性柔軟性部材上に前記剛性部材を下方に押しつけ、前記通路より前記透光性柔軟性部材を前記透光性剛性部材の縁部上面までオーバーフローさせる第二の工程と、加熱し各構成部材を構造的一体化させる第三の工程と、を有する発光装置の形成方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はバックライト光源、ディスプレイ、照明など各種光源や光センサに利用される発光装置に係わり、特に、良好な信頼性と光学特性とを兼ね合わせた発光装置に関するものである。

【０００２】

【従来技術】今日、高輝度、高出力な半導体発光素子や小型且つ高感度な発光装置が開発され種々の分野に利用されている。このような発光装置は、低消費電力、小型、及び軽量などの特徴を生かして、例えば、光プリンターヘッドの光源、液晶バックライト光源、各種メータの光源や各種読み取りセンサーなどに利用されている。

【０００３】このような発光装置の一例として、図２３に示す如き発光装置が挙げられる。凹部を有し且つリード電極が挿入されて一体成形されたプラスチック・パッケージ５を用い、前記凹部内底面から露出されたリード電極２上に発光素子としてＬＥＤチップをダイボンドすると共にＬＥＤチップの各電極とパッケージに設けられたリード電極とを金線などにより電気的に接続させる。このようにして凹部内に配置されたＬＥＤチップは硬化後に剛性を有する透光性部材によって封止される。これにより、パッケージ内部に配置されたＬＥＤチップやワイヤなどを、水分、外力など外部環境から保護することができ、極めて高い信頼性を有する発光装置が得られる。

【０００４】しかしながら、このような発光装置は、利用分野の広がりからより厳しい環境条件で使用され始めている。航空機や車載用に利用される発光装置では、例えば外気温により－２０℃以下＋８０℃以上にまで変化する場合もある。また、外気圧、熱衝撃などと同時に振動もある。このような場合、熱応力により各構成部材が膨張や収縮をくり返すことになり、それぞれの構造的一体性が弱くなり、光学特性に悪影響を及ぼす他、信頼性も低下してしまう。また、近紫外領域において高輝度に発光することが可能な発光素子が開発され使用されている現在において、上記領域の光による各部材の劣化を抑制することが重要となっている。



【０００５】そこで近年、光により切断されないシロキサン結合を有する樹脂が注目されている。このような樹脂は、上記領域の波長に対して優れた耐光性を有する他、柔軟性が高く且つ熱に対して高い安定性を有する。

【０００６】しかしながら、柔軟性を有することにより表面も軟質であり機械的強度が弱く、発光装置の外装としては不向きである。また、表面にタック性を有するため、異物が付着するため、発光面としては不向きである。

【０００７】そこで、特開２０００－１５０９６８号には、放熱性に優れたパッケージを用い、上記金属製基体上に載置された発光素子を、空壁内部に柔軟性を有し且つ耐光性に優れた部材を備えた剛性カバーにて被覆してなる発光装置が記載されている。このように構成された発光装置は、優れた耐熱性、耐光性、および外部からの機械的強度を兼ね備えることが可能となる。

【０００８】

【特許文献１】 特開２０００－１５０９６８号公報

【０００９】

【発明が解決しようとする課題】しかしながら、上記の如く、柔軟性を有する部材を剛性部材にて封止すると、封止する際に柔軟性部材に気泡が混入されやすい傾向にある。特に、気体を通過しない金属やガラス等からなる剛性部材にて密封すると、前記気泡により熱安定性が損なわれた柔軟性部材が熱応力を緩和できなくなり、隣接する剛性部材を破損する場合がある。また、柔軟性部材と剛性部材との界面に気泡が含有された場合、前記気泡が起因してこれらの界面が剥離され空気層が形成され、発光出力の低下や光学特性の変動が生じる。

【００１０】そこで本発明は、上記課題を解決し、高い信頼性を有し安定した光学特性を有する発光装置を提供する。

【００１１】

【発明を解決するための手段】即ち、本発明の発光装置は、発光素子チップと、該発光素子チップを被覆する透光性柔軟部材と、該柔軟性部材の上方に載置される透光性剛性部材と、を有する発光装置であって、前記透光性部材は主面と背面を有し、前記背面は前記発光素子方向へ突出していることを特徴とする。

【００１２】発光素子チップを柔軟性部材と剛性部材とを積層させて封止すると、これらの界面から気泡が混入されやすい。気泡が存在する発光装置は、高温下になる

と気泡の揮発爆発により一体性が損なわれてしまうため．実装基板等に一度に半田付けすることが可能なリフロー実装を施すことができず、量産性が乏しい。これに対して本願発明の発光装置は、剛性部材の形状を特定することにより．上記問題を解決し、リフロー実装をすることが可能な高い信頼性を有しており．Ｐｂフリー実装にも対応することが可能である。

【００１３】前記背面の断面形状は．前記発光素子方向へ突出していれば特に限定されないが．一点にて前記発光素子と最近接しているようなＶ字型であると．気泡混入の防止効率が高まり好ましい。

【００１４】また、前記一点が前記背面において中央部であると、界面全体において気泡の混入を効率よく防止することができる。また．前記背面を曲面とし．このような構成を有する背面にて柔軟性部材に圧力を加えると．前記柔軟性部材の流動速度が高速化されると共に気泡の脱泡効力を高めることができる。これにより．信頼性の高い発光装置を量産性良く形成することができる。また．下方の柔軟性部材との密着性が向上され好ましい。また、前記背面を凸形状とすると．剛性部材の主面側に柔軟性部材があふれ出ることを抑制することができる。

【００１５】また、前記剛性部材の下端は、外側へ広がる鍔部を有し．該鍔部の側面及び主面は前記柔軟性部材にて被覆されていることを特徴とする。このように鍔部を設けることにより、剛性部材の取り付け作業の容易化される。また．柔軟性部材との密着性が向上され．光学特性に悪影響を及ぼすことなく信頼性を高めることができる。

【００１６】また、前記発光素子チップを表面に設けられた凹部内に収納するパッケージを有し、前記パッケージは．少なくとも前記第一の凹部上方にて少なくとも外側へ向かって広がる第一の主面と、該第一の主面より上方にて外側へ広がる第二の主面と、該第二の主面より上方にて外側へ広がりパッケージの外部となる第三主面とを有し、前記柔軟性部材は．前記第一の主面、前記第二の主面、および前記剛性部材の下端部に渡り連続的に設けられていることを特徴とする。これにより、別途接着剤を用いることなく各部材の一体性を保つことができ、信頼性に優れた発光装置が得られる。これに対し少量の接着剤等で各部材を接着すると、前記接着剤等が局所的に熱劣化や光劣化し、これに起因して信頼性が低下してしまうが、上記構成とすることにより．局所的劣化を防止し．発光装置の長寿命化を実現している。

【００１７】また、前記第二の主面は．前記第一の主面上に離間して設けられた少なくとも３以上の各支持台の主面であり、前記剛性部材の一背面は前記第二の主面と接していることが好ましい。このような構成により、厳しい環境下にて使用され剛性部材と柔軟性部材とに剥離が生じたとしても、剥離箇所を前記支持台付近に制御することができ．光学特性を維持することができる。



【００１８】また前記剛性部材は、前記第二の主面の外郭内に少なくとも３以上の接点を有して内接しており、前記第一の主面および前記第二の主面は、それぞれ前記剛性部材の各接点間外部に露出部を有することが好ましい。このように構成された発光装置は．柔軟性部材上に剛性部材を載置する際に係る圧力を利用し、前記第二の主面により精度良く位置決めされた剛性部材と前記第一の主面の露出部の作用により、柔軟性部材中または柔軟性部材と剛性部材との界面に浸入した気泡を外部へ放出し．高い信頼性及び安定した光学特性を有する発光装置を歩留まり良く容易な手法にて得ることができる。前記柔軟性部材の表面は、硬化前の塗布された状態では表面張力により中央部が上方に凸を有する形状となる場合が多く．この凸部を一背面により圧力をかけパッケージ凹部により流動させることにより、柔軟性部材全体において気泡の脱泡作用を施すことができる。また、本発明の発光装置は、前記脱泡作用の際にオーバーフローされる柔軟性部材を利用し前記剛性部材と一体成型化されている。また、剛性部材の主面は、背面と反対側へ突出した曲面を有することが好ましい。このような形状を有する発光面は、凹部の内壁により反射散乱された光を集光し正面方向における輝度を高めることができる。特に、上記の如く凹部方向へ突出した曲面を有する背面は．光が拡散された状態にて剛性部材中へと入射されるので、主面側に背面と反対側へ突出した曲面を設け、光を集光させることが好ましい。

【００１９】更に、前記剛性部材の下端は、外側へ広がる鍔部を有し．該鍔部の側面及び主面は前記柔軟性部材にて被覆され．前記鍔部の背面は、前記第二の主面と平行で且つ対向していることが好ましく．これにより剛性部材と前記第二の主面との位置決め精度が向上され、各発光装置間に光軸のズレを生じることなく信頼性の高い発光装置を量産性良く提供することができる。

【００２０】また、第二の主面の外郭を、前記剛性部材の外郭より多くの角を有する多角形とすると、高密度実装することが可能な小型発光装置が得られる。

【００２１】また、剛性部材の外郭が前記接点においてＲを帯びていると、第二の主面へ柔軟性部材をオーバーフローさせる速度が高速化され、剛性部材を迅速に固着することができる。これにより、柔軟性部材へ係る応力が緩まり、脱泡作用が向上し信頼性が高まる。さらに、前記第二の主面および剛性部材下端部にかけて設けられる柔軟性部材は．なだらかで平坦な主面となり．好ましい外観が得られる。

【００２２】また、前記第一の主面において、前記露出部は．中央領域より外側へ突出した凸部であることを特徴とする。このような形状とすることにより、柔軟性部材を良好に第二の主面及び剛性部材下端部へ効率よく流動することができる。また．柔軟性部材が前記凸部壁面

と衝突することにより、柔軟性部材の脱泡作用が向上される。前記凸部は、前記第二の主面の角と対向していると、前記第二の主面の露出部上に均等な膜厚を有する柔軟性部材を形成することができ、構造的一体性を強化することができる。また、前記凸部の先端はRが帯びていると、更に効果が増大する。

【００２３】また、パッケージが、側面より一対のリード電極が挿入され成形樹脂にて一体成形されたものである場合、前記リード電極のインナー部は、前記第一の主面において該第一の主面の外郭に沿って露出されていることが好ましい。リード電極の表面は金属であるため、柔軟性部材の流動性が優れていると考えられる。本発明は、パッケージの各側壁にて柔軟性部材を衝突反動させ上方へ流動させる構成とすることにより、高い信頼性を有しているが、リード電極を前記衝突反動が行われる側壁に沿って設けると、柔軟性部材の衝突反動速度が加速され、気泡の脱泡作用の効果が強められる。

【００２４】また、リード電極のインナー部は、前記第一の主面の露出部から内側の二方向へ分離して設けられていることが好ましく、これにより上記効果を更に向上させることができる。また、一体成形されたリード電極の抜けが防止される。また、保護素子等、他の素子を載置する必要がある場合、それぞれの分離されたリードの間に載置し電気的に接続させると、発光観測面に関与しない位置に前記素子を載置することができ好ましい。

【００２５】また、リード電極のインナー部は、背面の一部がパッケージ背面側から貫通した微小孔より露出していることが好ましい。これにより、ワイヤボンディングされる際や剛性部材を載置する際に受けるリード電極の応力を和らげることができる。これにより、リード電極と各部材との構造的一体化を強化することができる。

【００２６】また、パッケージが、背面が実装面となる金属基体を有し、該金属基体の主面は前記凹部底面から露出され前記発光素子が載置されていることが好ましく、これにより、発光素子から生じる熱を良好に実装基板へと放熱することができ、発光素子を被覆する柔軟性部材の信頼性を高めることができる。また、前記金属基体表面にて下方の柔軟部材の流動性を向上され、発光素子近傍での局所的劣化を防止することができる。

【００２７】また、前記金属基体は、側面方向より挿入され前記成形樹脂にて前記リード電極と共に一体成形され、一端部が前記パッケージ側面より突出していることが好ましい。このように構成することにより、金属基体の外気との接触面積が増し、発光装置の放熱性を向上させることができる。

【００２８】また、金属基体は、前記凹部から露出される第一の主面と、前記パッケージ内に埋没する第二の主面とを有することが好ましく、これにより発光装置の構造的一体性が向上される。

【００２９】また、前記凹部底面から露出される金属基体の主面の中央部に第二の凹部を設け、該第二の凹部底面に発光素子を載置すると、発光素子端面から発光される光の取り出し効率が向上する他、柔軟性部材中への気泡混入防止や混入された気泡の脱泡作用、および発光装置使用時の発光素子近傍での柔軟性部材流動性も向上される。また、柔軟性部材と放熱経路となる金属基体との接触面積が大きくなり、柔軟性部材の局所劣化を防止することができる。



【００３０】また、一対のリード電極の一端部は、金属基体の一端部が露出された側面と反対側の側面より所定の距離を隔てて並列に露出していることが好ましい。これにより、実装基板の電極配線を簡易化することができる。また、金属基体の背面面積を保ちつつ発光装置を小型化に形成することができる。更に、パッケージの背面において、上記反対側の側面側に切欠部を設けることにより、金属基体の背面に設ける導電部材が多すぎた場合でも、前記導電部材がリード電極方向へ流出することを前記切欠部にてとどめ、対向するリード電極まで流出することを防止することができ、歩留まりが向上される。

【００３１】また、発光素子が同一平面側に正負一対の電極を有し、該正負一対の電極がそれぞれ前記一対のリード電極のインナー部とワイヤにて架橋されている場合、前記ワイヤの頂点は、前記第一主面と前記第二の主面の間に配置されていることが好ましい。このようにワイヤを設けることにより、柔軟性部材の流動性が向上されるとともに、ワイヤに係る熱応力の影響を最小限とすることができる。また、リード電極が発光素子の各電極より上方に配置され、且つ発光素子からリード電極までのワイヤの通過点に上方へ突出した障害を有さないので、ワイヤボンディング作業を比較的容易に且つ信頼性高く行うことができる。

【００３２】また、前記柔軟性部材に蛍光物質を含有させることも可能であり、前記柔軟性部材を少なくとも２つ以上の層からなる積層構造にて構成とする場合、前記蛍光物質は少なくとも１層に含有されていればよい。

【００３３】

【発明の実施の形態】本発明者は種々の実験の結果、発光素子チップを柔軟性部材と剛性部材にて被覆する際において、剛性部材部材の形状を特定することにより、上記問題を解決することができることを見いだし、本発明を成すに至った。以下、本発明の各構成について詳述する。

【００３４】（パッケージ１）パッケージは、例えば図１に示すように、正のリード電極と負のリード電極５、およびヒートシンクとなる金属基体とが、それぞれ対向した側面よりインサートされて閉じられた金型内に、下面側にあるゲートから溶融された成形樹脂を流し込み硬化して形成される。

【００３５】詳細に説明すると、パッケージは、主面側に第一の凹部を有し、該凹部底面より前記パッケージの

一側面より挿入された金属基体６の主面が露出している。前記金属基体６の主面には、発光素子が収納可能な第二の凹部が設けられている。

【００３６】一方、前記第一の凹部の上方において外側へ広がる第一の主面、及び前記第一の主面の上方において外側へ広がる第二の主面が設けられている。前記第一の主面より前記パッケージの一側面と対向した他方の側面より挿入された正負一対のリード電極の主面が露出している。前記リード電極の主面は、前記発光素子の各電極とそれぞれワイヤにて電気的に接続されている。また、前記第二の主面は上方に載置される剛性部材の位置決めの役割を成している。

【００３７】このような構成を有するパッケージを用い、前記パッケージの凹部底面に発光素子が電気的に接続され、これらを第一の封止部材である柔軟性部材および第二の封止部材である剛性部材にて密封して本発明の発光装置が得られる。

【００３８】ここで、前記第一の凹部にて露出するリード電極主面は、前記発光素子チップの各電極と架橋される導電ワイヤーを固着するに必要な面積が露出していれば良く、図１６の如くその他のリード電極主面はパッケージ樹脂と同一材料にて覆われていることが好ましい。これにより、リード電極と第一の封止部材との界面に生じる気化膨脹を抑制することができる。また、比較的密着性の強いパッケージ成形樹脂と封止部材との接触面積を大きくすることより、発光装置の一体性を高め、光学特性及び信頼性の高い発光装置が得られる。

【００３９】ここで、本実施の形態のパッケージは、前記第二の封止部材から外側に前記第一の主面と前記第二の主面の一部が露出可能な形状とされている。本実施の形態では、第二の主面の外壁をＲ取りされた四角とし、該四角内に外郭が円である第二の封止部材が内接され、該第二の封止部材の外周４箇所にて、前記第二の主面の縁部および前記第一の主面の縁部の双方が露出している。このように本発明は、パッケージ内部に柔軟性部材を封止した後、上方に剛性部材を載置した際、前記剛性部材に塞がれずパッケージの底面から上方まで一貫した通路を設けることにより、前記通路より柔軟性部材と共に気泡も押し出され、剛性部材と柔軟性部材との間に気泡が混入することを抑制することができる。特に本実施の形態では、前記第一の主面の露出部を前記第一の主面の中央部から突出した凸形状とすることにより、前記凸形状の外郭による衝突反射により気泡の脱泡効果を向上させている。本実施の形態ではパッケージの形態を調整することによりこのような一貫通路を形成しているが、これに限られるものではなく、レンズの縁部に切欠を形成することにより形成することもできる。

【００４０】（リード電極５）リード電極は、銅や鉄入り銅等の高熱伝導体を用いて構成することができる。また、発光素子からの光の反射率の向上及びリード基材の酸化防止等のために、リード電極の表面に銀、アルミ、銅や金等の金属メッキを施すこともでき、またリード電極の表面の反射率を向上させるため平滑にすることが好ましい。また、リード電極の面積は大きくすることが好ましく、このようにすると放熱性を高めることができ、配置される発光素子チップの温度上昇を効果的に抑制することができる。これによって、発光素子チップに比較的多くの電力を投入することが可能となり光出力を向上させることができる。

【００４１】リード電極は、例えば、０．１５ｍｍ厚の銅合金属からなる長尺金属板をプレスを用いた打ち抜き加工により形成される。本実施の形態では、一方向に正のリード電極と負のリード電極が連なるようにプレス加工を施している。

【００４２】本発明の発光装置において、リード電極の背面と側面との交わる角は曲線を帯びていることが好ましい。このように、樹脂を注入する方向に合わせてリード電極の端部に丸みを設けると成形樹脂の流れがスムーズとなり、前記リード電極と成形樹脂部との密着性が強化させる。また、パッケージ底面に露出された一対のリード電極間の空間に隙間なく樹脂を充填させることができる。また、成形樹脂部のリード電極との接合ラインは、前記リード電極と対応した形状となる。よって上記の形状を有するリード電極を用いると、成形樹脂部の側面上の前記背面との接合ラインは、底角が曲線を帯びた凹部形状とすることができる。これにより前記接合ラインにおける応力集中が回避されパッケージ・クラックの発生を抑制することができる。

【００４３】また更に、リード電極の主面と側面との交わる角は鋭角に盛り上がっていることが好ましい。これにより、リード電極と第一の封止部材との密着性が向上され、これらの界面での剥離を抑制することができる。

【００４４】また、パッケージ成形体の外壁から突き出した正のリード電極と負のリード電極のアウタ・リード部は、背面が成型樹脂部の背面、および金属基体の背面と同一平面を成すようにガルウィング型に加工され、正負の接続端子部となっている。尚、本発明の接続端子部の構造は、ガルウィング型に限られるものではなく、Ｊ－ベンド（Ｂｅｎｄ）等、他の構造であってもよい。

【００４５】（金属基体６）本実施の形態の発光装置に用いられるパッケージは、中央部に、発光素子を収納し前記発光素子からの発熱を良好に放熱することが可能な金属基体を有する。前記金属基体は、主面側に凹部を有し、背面は発光装置の実装面、つまりリード電極の接続端子部背面、および成型樹脂部背面とほぼ同一平面上に位置しており、実装基板と接するように構成されている。このように構成することにより、発光素子からの発熱を直接実装基板へと放熱することができ、発光素子への電流投下量を増大させ出力向上を図ることができる。前記凹部底面の肉厚は、良好な放熱性を有するように薄

膜に形成されている。前記凹部は、発光装置の中央部に位置することが好ましく、これにより良好な指向特性が得られる。また凹部は、前記発光素子全体を収納することが可能な容積を有することが好ましい。これにより、発光素子の四方側面から発光される光を前記凹部内壁にて良好に正面方向へ取り出すことができる。また、色変換層を用いて発光素子の波長を変換させる場合、前記凹部内に配置された前記発光素子全体を色変換層で容易に被覆することが可能となる。前記色変換層は、透光性部材と前記発光素子から発光される光の一部を吸収し他の波長を発光することが可能な蛍光物質とからなる。本発明に用いられる金属パッケージは、特に発光素子が配置される凹部の放熱性が優れているため、前記色変換層の各部材は無機物に限らず有機物を用いることも可能であり、大電流投下による前記有機物の劣化はほとんどおこらず、良好な光学特性が得られる。また、前記凹部の内壁は、容積が開口側へいくほど大きくなるようにがテーパー形状であることが好ましく、これにより更に高輝度に発光することが可能な発光装置が得られる。

【００４６】前記凹部は、例えば金属平板に絞り加工を施すことにより構成される。本実施の形態では、金属平板の主面方向から絞り加工を施して金属を背面方向に窪し凹部を形成する。これにより、背面の外郭は凹凸を有する形状となり、成型樹脂部との接触面積が増大され、構造的一体性を強化することができる。

【００４７】前記リード電極及び金属基体の熱伝導率はそれぞれ、１０Ｗ／ｍ・Ｋ以上１００Ｗ／ｍ・Ｋ以下の範囲であることが好ましく、より好ましくは１５Ｗ／ｍ・Ｋ以上８０Ｗ／ｍ・Ｋ以下、更に好ましくは１５Ｗ／ｍ・Ｋ以上５０Ｗ／ｍ・Ｋ以下である。、信頼性を維持しながら大電流を長時間投下することが可能な発光装置が得られる。

【００４８】（発光素子２）本発明で用いられる発光素子チップは、特に限定されないが、上記の如く一対のリード電極と金属基体とが成型樹脂にてインサート成形されている場合、同一面側に正負一対の電極を有する発光素子チップが用いられる。また、蛍光物質を用いた場合、該蛍光物質を励起可能な発光波長を発光できる発光層を有する半導体発光素子が好ましい。このような半導体発光素子として２ｎＳｅやＧａＮなど種々の半導体を挙げることができるが、蛍光物質を効率良く励起できる短波長が発光可能な窒化物半導体（$In_xAl_yGa_{1-x-y}N$、$0 \leq X$、$0 \leq Y$、$X+Y \leq 1$）が好適に挙げられる。また所望に応じて、前記窒化物半導体にボロンやリンを含有させることも可能である。半導体の構造としては、ＭＩＳ接合、ＰＩＮ接合やｐｎ接合などを有するホモ構造、ヘテロ構造あるいはダブルヘテロ構成のものが挙げられる。半導体層の材料やその混晶度によって発光波長を種々選択することができる。また、半導体活性層を量子効果が生ずる薄膜に形成させた単一量子井戸構造や多重量子井戸構造とすることもできる。窒化物半導体を使用した場合、半導体用基板にはサファイヤ、スピネル、ＳｉＣ、Ｓｉ、ＺｎＯ、およびＧａＮ等の材料が好適に用いられる。結晶性の良い窒化物半導体を量産性よく形成させるためにはサファイヤ基板を用いることが好ましい。このサファイヤ基板上にＭＯＣＶＤ法などを用いて窒化物半導体を形成させることができる。サファイア基板上にＧａＮ、ＡｌＮ、ＧａＡｌＮ等のバッファー層を形成しその上にｐｎ接合を有する窒化物半導体を形成させる。窒化物半導体を使用したｐｎ接合を有する発光素子例として、バッファ層上に、ｎ型窒化ガリウムで形成した第１のコンタクト層、ｎ型窒化アルミニウム・ガリウムで形成させた第１のクラッド層、窒化インジウム・ガリウムで形成した活性層、ｐ型窒化アルミニウム・ガリウムで形成した第２のクラッド層、ｐ型窒化ガリウムで形成した第２のコンタクト層を順に積層させたダブルヘテロ構成などが挙げられる。窒化物半導体は、不純物をドープしない状態でｎ型導電性を示す。発光効率を向上させるなど所望のｎ型窒化物半導体を形成させる場合は、ｎ型ドーパントとしてＳｉ、Ｇｅ、Ｓｅ、Ｔｅ、Ｃ等を適宜導入することが好ましい。一方、ｐ型窒化物半導体を形成させる場合は、ｐ型ドーパントであるＺｎ、Ｍｇ、Ｂｅ、Ｃａ、Ｓｒ、Ｂａ等をドープさせる。窒化物半導体は、ｐ型ドーパントをドープしただけではｐ型化しにくいためｐ型ドーパント導入後に、炉による加熱やプラズマ照射等により低抵抗化させることが好ましい。また、前記ｐ型層上に金属層を積層した後、半導体用基板を除去してもよい。このように構成された発光素子を前記金属層が実装面側となるように実装すると、放熱性の高い発光装置が得られる。それぞれ露出されたｐ型層及びｎ型層上に各電極を形成後、半導体ウエハーからチップ状にカットさせることで窒化物半導体からなる発光素子を形成させることができる。

【００４９】本発明の発光ダイオードにおいて、白色系を発光させるには、蛍光物質からの発光波長との補色関係や透光性樹脂の劣化等を考慮して、発光素子の発光波長は４００ｎｍ以上５３０ｎｍ以下が好ましく、４２０ｎｍ以上４９０ｎｍ以下がより好ましい。発光素子と蛍光物質との励起、発光効率をそれぞれより向上させるためには、４５０ｎｍ以上４７５ｎｍ以下がさらに好ましい。

【００５０】なお本発明では、発光素子チップが耐光性に優れ且つ柔軟性を有する第一の封止部材にて信頼性高く封止されているため、近紫外線や紫外線による構成部材の局所的劣化を抑制することができる。よって、本発明の発光装置に４００ｎｍより短い紫外線領域を主発光波長とする発光素子を用い、前記発光素子からの光の一部を吸収して他の波長を発光することが可能な蛍光物質とを組み合わせることで、色ムラの少ない色変換型発光装置が得られる。ここで、前記蛍光物質を発光素子チッ

プにバインダーする際には、比較的紫外線に強い樹脂や無機物であるガラス等を用いることが好ましい。

【００５１】ここで、発光素子は、例えば、青色の発光が可能な窒化ガリウム系化合物半導体素子であり、該素子は、例えばサファイア基板上にｎ型層、活性層及びｐ型層を含む窒化物半導体層が形成され、活性層及びｐ型層の一部を除去して露出させたｎ型層の上にｎ電極が形成され、ｐ型層の上にｐ電極が形成されてなる。

【００５２】（柔軟性部材３）前記発光素子を覆うように、パッケージの凹部内から上方の剛性部材下端部にかけて柔軟性部材が設けられている。前記柔軟性部材は水分等から発光素子を保護することができる他、透光性を有しており発光素子からの光を効率よく外部に取り出すことができる。また、熱に対して高い安定性を有しているため、発光装置の作動時に生じる熱応力を緩和させることができる。また、近紫外領域または紫外領域の発光素子を用いた場合、これらの光に対して耐光性に優れた柔軟性部材を用いることが好ましい。これら柔軟性を有する部材として、ゴム状弾性樹脂、ゲル状樹脂等が挙げられる。これらの樹脂は、架橋密度が低い又は架橋構造を有さないことから、良好な柔軟性を有することができる。また、発光素子チップからの光に対して特定のフィルター効果等を持たす為に着色染料や着色顔料を添加することもできる。

【００５３】（剛性部材４）本発明の発光装置において、発光素子周囲に設けられた柔軟性部材は剛性部材にて封止されている。本発明に用いられる剛性部材は、機械的強度を有し且つ透光性であれば特に限定されない。

【００５４】本実施の形態において、前記光取り出し窓部である剛性部材は、前記金属パッケージの凹部に配置された発光素子の上面に位置しており、前記凹部の内壁の延長線と交点との内部が発光に関与する面となる。発光素子の端部から発光される光は、前記柔軟性部材中の前記凹部の側面にて反射散乱されて、剛性部材を通過し正面方向に取り出される。これらの反射散乱光の存在範囲は、ほぼ前記凹部の側面の延長線内であると考えられる。そこで、前記交点の内部の形状をあらゆる形状に調整することにより、所望とする輝度を発光することが可能な発光装置が得られる。また、剛性部材の基材は、パッケージ本体を形成する成型樹脂、および下部に設けられる柔軟性部材と熱膨張係数が近似していることが好ましい。

【００５５】剛性部材の形状は、連続した一背面を有することが好ましい。これにより、柔軟性部材との界面に気泡が侵入されることなく信頼性高く設置することが可能となる。また、背面の外周に縁部を設けると、さらに信頼高く設置することができる。前記縁部は、発光素子が収納される凹部側面の延長線外部に設けられることが好ましく、これにより光学特性に影響を与えることなく信頼性を高めることが可能となる。一方、主面側は、前記凹部側面の延長線内部において中央部が突出した曲面を有することが好ましい。これにより背面側にて拡散された光を正面方向に効率良く収束することができ、正面方向の光度を高めることができる。本発明において剛性部材は、前記第二の主面の外郭内に内接され、凹部底面から主面側へ一貫した通路を通じてオーバーフローされた柔軟性部材により、各部材と構造的に一体化されている。このような剛性部材は、内部、主面側表面、背面側表面において、発光素子チップからの光に対して特定のフィルター効果等を持たす為に着色染料や着色顔料を添加することもできる。



【００５６】（蛍光物質８）本発明において、柔軟性部材および剛性部材等に蛍光物質８等の他物質を含有させてもよい。ここで、本実施例で用いられている蛍光物質について詳述する。

【００５７】本発明では、各構成部材に無機蛍光物質や有機蛍光物質等、種々の蛍光物質を含有させることが出来る。このような蛍光物質の一例として、無機蛍光体である希土類元素を含有する蛍光体がある。希土類元素含有蛍光体として、具体的には、Ｙ、Ｌｕ、Ｓｃ、Ｌａ、Ｇｄ及びＳｍの群から選択される少なくとも１つの元素と、Ａｌ、Ｇａ、及びｉｎの群から選択される少なくとも１つの元素とを有するざくろ石型蛍光体が挙げられる。特に、セリウムで付活されたイットリウム・アルミニウム酸化物系蛍光体が好ましく、所望に応じてＣｅに加えＴｂ、Ｃｕ、Ａｇ、Ａｕ、Ｆｅ、Ｃｒ、Ｎｄ、Ｄｙ、Ｎｉ、Ｔｉ、Ｅｕ、およびＰｒ等を含有させることも可能である。

【００５８】本実施例の発光装置では、窒化物系半導体を発光層とする半導体発光素子から発光された光を励起させて発光できるセリウムで付活されたイットリウム・アルミニウム酸化物系蛍光物質をベースとした蛍光物質を用いている。

【００５９】具体的なイットリウム・アルミニウム酸化物系蛍光物質としては、$YAlO_3$：Ｃｅ、$Y_3Al_5O_{12}$：Ｃｅ（ＹＡＧ：Ｃｅ）や$Y_4Al_2O_9$：Ｃｅ．更にはこれらの混合物などが挙げられる。イットリウム・アルミニウム酸化物系蛍光物質にＢａ、Ｓｒ、Ｍｇ、Ｃａ、Ｚｎの少なくとも一種が含有されていてもよい。また、Ｓｉを含有させることによって、結晶成長の反応を抑制し蛍光物質の粒子を揃えることができる。

【００６０】本明細書において、Ｃｅで付活されたイットリウム・アルミニウム酸化物系蛍光物質は特に広義に解釈するものとし、イットリウムの一部あるいは全体を、Ｌｕ、Ｓｃ、Ｌａ、Ｇｄ及びＳｍからなる群から選ばれる少なくとも１つの元素に置換され、あるいは、アルミニウムの一部あるいは全体をＢａ、Ｔｌ、Ｇａ、ｉｎの何れか又は両方で置換され蛍光作用を有する蛍光体を含む広い意味に使用する。

【００６１】更に詳しくは、一般式$(Y_zGd_{1-z})_3A$

$(Y_{1-z}Gd_z)_3O_{12}:Ce$（但し、$0<z\leq 1$）で示されるフォトルミネッセンス蛍光体や一般式$(Re^1_{1-a}Sm_a)_3Re^2_5O_{12}:Ce$（但し、$0\leq a<1$、$0\leq b\leq 1$、$Re^1$は、Y、Gd、La、Scから選択される少なくとも一種、$Re^2$は、Al、Ga、Inから選択される少なくとも一種である。）で示されるフォトルミネッセンス蛍光体である。

【００６２】この蛍光物質は、ガーネット構造（ざくろ石型構造）のため、熱、光及び水分に強く、励起スペクトルのピークを４５０ｎｍ付近にさせることができる。また、発光ピークも、５８０ｎｍ付近にあり７００ｎｍまですそを引くブロードな発光スペクトルを持つ。

【００６３】またフォトルミネセンス蛍光体は、結晶中にＧｄ（ガドリニウム）を含有することにより、４６０ｎｍ以上の長波長域の励起発光効率を高くすることができる。Ｇｄの含有量の増加により、発光ピーク波長が長波長に移動し全体の発光波長も長波長側にシフトする。すなわち、赤みの強い発光色が必要な場合、Ｇｄの置換量を多くすることで達成できる。一方、Ｇｄが増加すると共に、青色光によるフォトルミネセンスの発光輝度は低下する傾向にある。さらに、所望に応じてＣｅに加えＴｂ、Ｃｕ、Ａｇ、Ａｕ、Ｆｅ、Ｃｒ、Ｎｄ、Ｄｙ、Ｃｏ、Ｎｉ、Ｔｉ、Ｅｕらを含有させることもできる。

【００６４】しかも、ガーネット構造を持ったイットリウム・アルミニウム・ガーネット（ざくろ石型）系蛍光体の組成のうち、Ａｌの一部をＧａで置換することで発光波長が短波長側にシフトする。また、組成のＹの一部をＧｄで置換することで、発光波長が長波長側にシフトする。

【００６５】Ｙの一部をＧｄで置換する場合、Ｇｄへの置換を１割未満にし、且つＣｅの含有（置換）を０．０３から１．０にすることが好ましい。Ｇｄへの置換が２割未満では緑色成分が大きく赤色成分が少なくなるが、Ｃｅの含有量を増やすことで赤色成分を補え、輝度を低下させることなく所望の色調を得ることができる。このような組成にすると温度特性が良好となり発光ダイオードの信頼性を向上させることができる。また、赤色成分を多く有するように調整されたフォトルミネセンス蛍光体を使用すると、ピンク等の中間色を発光することが可能な発光装置を形成することができる。

【００６６】このようなフォトルミネセンス蛍光体は、Ｙ、Ｇｄ、Ａｌ、及びＣｅの原料として酸化物、又は高温で容易に酸化物になる化合物を使用し、それらを化学量論比で十分に混合して原料を得る。又は、Ｙ、Ｇｄ、Ｃｅの希土類元素を化学量論比で酸に溶解した溶解液を蓚酸で共沈したものを焼成して得られる共沈酸化物と、酸化アルミニウムとを混合して混合原料を得る。これにフラックスとしてフッ化バリウムやフッ化アンモニウム等のフッ化物を適量混合して坩堝に詰め、空気中１３５０～１４５０°Ｃの温度範囲で２～５時間焼成して焼成品を得、つぎに焼成品を水中でボールミルして、洗浄、分離、乾燥、最後に篩を通すことで得ることができる。



【００６７】本願発明の発光装置において、このようなフォトルミネセンス蛍光体は、２種類以上のセリウムで付活されたイットリウム・アルミニウム・ガーネット（ざくろ石型）蛍光体や他の蛍光体を混合させてもよい。

【００６８】また、本発明で用いられる蛍光物質の粒径は１０μｍ～５０μｍの範囲が好ましく、より好ましくは１５μｍ～３０μｍである。１５μｍより小さい粒径を有する蛍光物質は、比較的凝集体を形成しやすく、液状樹脂中において塊になって沈降されるため、光の透過効率を減少させてしまう。本発明では、このような蛍光物質を有しない蛍光物質を用いることにより蛍光物質による光の隠蔽を抑制し発光装置の出力を向上させる。また本発明の粒径範囲である蛍光物質は光の吸収率及び変換効率が高く且つ励起波長の幅が広い。このように、光学的に優れた特徴を有する大粒径蛍光物質を含有させることにより、発光素子の主波長周辺の光をも良好に変換し発光することができ、発光装置の量産性が向上される。

【００６９】ここで本発明において、粒径とは、体積基準粒度分布曲線により得られる値である。前記体積基準粒度分布曲線は、レーザ回折・散乱法により粒度分布を測定し得られるもので、具体的には、気温２５℃、湿度７０％の環境下において、濃度が０．０５％であるヘキサメタリン酸ナトリウム水溶液に各物質を分散させ、レーザ回折式粒度分布測定装置（ＳＡＬＤ－２０００Ａ）により、粒径範囲０．０３μｍ～７００μｍにて測定し得られたものである。この体積基準粒度分布曲線において積算値が５０％のときの粒径値であり、本発明で用いられる蛍光物質の中心粒径は１５μｍ～５０μｍの範囲であることが好ましい。また、この中心粒径値を有する蛍光物質が頻度高く含有されていることが好ましく、頻度値は２０％～５０％が好ましい。このように粒径のバラツキが小さい蛍光物質を用いることにより色ムラが抑制され良好な色調を有する発光装置が得られる。

【００７０】蛍光物質の配置場所は特に限定されず、剛性部材の窓部の背面にバインダーしても良いし、剛性部材や柔軟性部材の各材料に直接含有させても良い。剛性部材の背面や発光素子の表面にバインダーにて蛍光物質を付着させる場合、前記バインダーの材質は特に限定されず、有機物及び無機物のいずれをも用いることができる。バインダーとして有機物を使用する場合、具体的材料として、エポキシ樹脂、アクリル樹脂、シリコーンなどの耐候性に優れた透明樹脂が好適に用いられる。特にシリコーンを用いると信頼性に優れ且つ蛍光物質の分散性を向上させることができ好ましい。

【００７１】また、レンズ表面に蛍光物質を載置する場合、バインダーとしての熱膨張率と近似である無機物を

使用すると、蛍光物質を良好に固着させることができ好ましい。具体的方法として、沈降法やゾルーゲル法等を用いることができる。例えば、蛍光物質、シラノール（Ｓｉ（ＯＥｔ）３ＯＨ）、及びエタノールを混合してスラリーを形成し、該スラリーをノズルから剛性部材の窓部に吐出させた後、３００℃にて３時間加熱してシラノールをＳｉＯ２とし、蛍光物質を固着させることができる。

【００７２】また、無機物である結着剤をバインダーとして用いることもできる。結着剤とは、いわゆる低融点ガラスであり、微細な粒子であり且つ紫外から可視領域のふく射線に対して吸収が少なくバインダー中にて極めて安定であることが好ましく、沈殿法により得られた細かい粒子であるアルカリ土類のほう酸塩が適している。

【００７３】また、大きい粒径を有する蛍光物質を付着させる場合、融点が高くても粒子が超微粉体である結着剤、例えば、デグサ製のシリカ、アルミナ、あるいは沈殿法で得られる細かい粒度のアルカリ土類金属のピロりん酸塩、正りん酸塩などを使用することが好ましい。これらの結着剤は、単独、若しくは互いに混合して用いることができる。

【００７４】ここで、上記結着剤の塗布方法について述べる。結着剤は、結着効果を十分に高めるため、ビヒクル中に湿式粉砕しスラリー状にして結着剤スラリーとして用いることが好ましい。前記ビヒクルとは、有機溶媒あるいは脱イオン水に少量の粘結剤を溶解して得られる高粘度溶液である。例えば、有機溶媒である酢酸ブチルに対して粘結剤であるニトロセルロースを１ｗｔ％含有させることにより、有機系ビヒクルが得られる。

【００７５】このようにして得られた結着剤スラリーに蛍光物質を含有させて塗布液を作製する。塗布液中のスラリーの添加量は、前記塗布液中の蛍光物質量に対して前記スラリー中の結着剤の総量が１～３％ｗｔ程度であることが好ましい。結着剤の添加量が多すぎると、光束維持率が低下する傾向にあるので、最小限の使用にとどめることが好ましい。

【００７６】剛性部材の背面又は主面に上記結着剤にて蛍光物質を固着させたい場合、前記塗布液を前記窓部の背面に塗布し、その後、温風あるいは熱風を吹き込み乾燥させる。最後に４００℃～７００℃の温度でベーキングを行い、前記ビヒクルを飛散させる。これにより前記窓部の表面に蛍光体層が前記結着剤にて付着される。

【００７７】（拡散剤）更に、本発明において、上記の色変換部材中に蛍光物質に加えて拡散剤を含有させても良い。具体的な拡散剤としては、チタン酸バリウム、酸化チタン、酸化アルミニウム、酸化珪素等が好適に用いられる。これによって良好な指向特性を有する発光装置が得られる。

【００７８】ここで本明細書において拡散剤とは、中心粒径が１ｎｍ以上５μｍ未満のものをいう。１μｍ以上５μｍ未満の拡散剤は、発光素子及び蛍光物質からの光を良好に乱反射させ、大きな粒径の蛍光物質を用いることにより生じやすい色ムラを抑制することができ好ましい。また、発光スペクトルの半値幅を狭めることができ、色純度の高い発光装置が得られる。一方、１ｎｍ以上１μｍ未満の拡散剤は、発光素子からの光波長に対する干渉効果が低い反面、透明度が高く、光度を低下させることなく樹脂粘度を高めることができる。これにより、ポッティング等により色変換部材を配置させる場合、シリンジ内において樹脂中の蛍光物質をほぼ均一に分散させその状態を維持することが可能となり、比較的取り扱いが困難である粒径の大きい蛍光物質を用いた場合でも歩留まり良く生産することが可能となる。このように本発明における拡散剤は粒径範囲により作用が異なり、使用方法に合わせて適宜若しくは組み合わせて用いることができる。

【００７９】（フィラー）更に、本発明において、色変換部材中に蛍光物質に加えてフィラーを含有させても良い。具体的な材料は拡散剤と同様であるが、拡散剤と中心粒径が異なり、本明細書においてフィラーとは中心粒径が５μｍ以上１００μｍ以下のものをいう。このような粒径のフィラーを透光性樹脂中に含有させると、光散乱作用により発光装置の色度バラツキが改善される他、透光性樹脂の耐熱衝撃性を高めることができる。これにより高温下での使用においても、発光素子と外部電極とを電気的に接続しているワイヤーの断線や前記発光素子底面とパッケージの凹部底面と剥離等を防止することができる信頼性の高い発光装置が得られる。更には樹脂の流動性を長時間一定に調整することが可能となり所望とする場所内に封止部材を形成することができ歩留まり良く量産することが可能となる。

【００８０】また、フィラーは蛍光物質と類似の粒径及び／又は形状を有することが好ましい。ここで本明細書では、類似の粒径とは、各粒子のそれぞれの中心粒径の差が２０％未満の場合をいい、類似の形状とは、各粒径の真円との近似程度を表す円形度（円形度＝粒子の投影面積に等しい真円の周囲長さ／粒子の投影の周囲長さ）の値の差が２０％未満の場合をいう。このようなフィラーを用いることにより、蛍光物質とフィラーが互いに作用し合い、樹脂中にて蛍光物質を良好に分散させることができ色ムラが抑制される。更に、蛍光物質及びフィラーは、共に中心粒径が１５μｍ～５０μｍ、より好ましくは２０μｍ～５０μｍであると好ましく、このように粒径を調整することにより、各粒子間に好ましい間隔を設けて配置させることができる。これにより光の取り出し経路が確保され、フィラー混入による光度低下を抑制しつつ指向特性を改善させることができる。

【００８１】

【実施例】以下、本発明に係る実施例の発光装置について詳述する。なお、本発明は以下に示す実施例のみに限

定されるものではない。

【００８２】（実施例１）図１に示すような表面実装型の発光装置を形成する。ＬＥＤチップは、発光層として単色性発光ピークが可視光である４７５ｎｍのＩｎ０．２Ｇａ０．８Ｎ半導体を有する窒化物半導体素子を用いる。より具体的にはＬＥＤチップは、洗浄させたサファイヤ基板上にＴＭＧ（トリメチルガリウム）ガス、ＴＭＩ（トリメチルインジウム）ガス、窒素ガス及びドーパントガスをキャリアガスと共に流し、ＭＯＣＶＤ法で窒化物半導体を成膜させることにより形成させることができる。ドーパントガスとしてＳｉＨ４とＣｐ２Ｍｇを切り替えることによってｎ型窒化物半導体やｐ型窒化物半導体となる層を形成させる。

【００８３】ＬＥＤチップの素子構造としてはサファイア基板上に、アンドープの窒化物半導体であるｎ型ＧａＮ層、Ｓｉドープのｎ型電極が形成されｎ型コンタクト層となるＧａＮ層、アンドープの窒化物半導体であるｎ型ＧａＮ層、次に発光層を構成するバリア層となるＧａＮ層、井戸層を構成するＩｎＧａＮ層、バリア層となるＧａＮ層を１セットとしＧａＮ層に挟まれたＩｎＧａＮ層を５層積層させた多重量子井戸構造としてある。発光層上にはＭｇがドープされたｐ型クラッド層としてＡｌＧａＮ層、Ｍｇがドープされたｐ型コンタクト層であるＧａＮ層を順次積層させた構成としてある。（なお、サファイヤ基板上には低温でＧａＮ層を形成させバッファ層とさせてある。また、ｐ型半導体は、成膜後４００℃以上でアニールさせてある。）

【００８４】エッチングによりサファイア基板上の窒化物半導体に同一面側で、ｐｎ各コンタクト層表面を露出させる。各コンタクト層上に、スパッタリング法を用いて正負各台座電極をそれぞれ形成させる。なお、ｐ型窒化物半導体上の全面には金属薄膜を透光性電極として形成させた後に、透光性電極の一部に台座電極を形成させてある。出来上がった半導体ウエハーをスクライブラインを引いた後、外力により分割させ半導体発光素子であるＬＥＤチップを形成させる。

【００８５】一方、０．３ｍｍ厚の第一の銅板に打ち抜き加工を施し、一方方向に連なった一対のリード電極を複数個形成する。次に、前記第一の銅板より厚い肉厚からなる、１．２ｍｍ厚の第二の銅板に打ち抜き加工およびプレス加工を施し、主面側に発光素子チップを収納可能な凹部を有する金属基体を複数個形成する。前記一対のリード電極と前記金属基体をそれぞれ対向する方向より挿入し、前記金属基体の上方で前記金属基体を介してそれぞれのリード電極が対称となるように、金属金型内に配置する。この際、各リード電極のインナー先端部は、下方から支持体にて固定されている。

【００８６】このように金型内に設置された前記第一の銅板および前記第二の銅板を、成型樹脂により一体成形し、パッケージを作成する。このようにして得られたパッケージは、主面側に前記金属基体の凹部が露出する第一の凹部、該第一の凹部の上方にて外側へ広がる第一の主面、該第一の主面の上方にて外側へ広がる第二の主面、とを有している。前記第二の主面の外郭は角取りされた四角形であり、前記第一の主面の開部は、前記第二の主面の隅部へ向かってそれぞれ突出部を設ける。前記突出部は、上方に剛性部材を載置した際に該剛性部材外部に露出するように構成されている。



【００８７】次に、前記金属基体に設けられた凹部内に、Ａｇ－Ｓｎ合金にてＬＥＤチップをダイボンドする。ここでダイボンドに用いられる接合部材は、上記のような合金の他、導電性材料が含有された樹脂又はガラス等を用いることができる。含有される導電性材料はＡｇが好ましく、含有量が８０％～９０％であるＡｇペーストを用いると放熱性に優れて且つ接合後の応力が小さい発光装置が得られる。また、発光素子の基板側に金属層を設けて固着すると、放熱性および光取り出し効率が向上し好ましい。

【００８８】次に、ダイボンドされたＬＥＤチップの各電極と、パッケージ凹部底面から露出された各リード電極とをそれぞれＡｇワイヤにて電気的導通を取る。ここで構成部材に樹脂を用いない場合、Ａｌワイヤを用いることも可能である。

【００８９】次に、前記凹部から第二の主面を覆うように、ゲル状シリコーン樹脂をポッティングにより注入し、続いて前記ゲル状シリコーン樹脂上に透光性剛性部材としてガラスよりなるレンズを下方に押しつけて載置する。ここで前記レンズは、プラスティックである熱可塑性樹脂やガラス等で構成することができる。また、連続する一背面を有し、下方に突出した曲面を有している。また外周部に背面が前記第二の主面と平行である縁部を有している。さらに、前記縁部の外郭は前記第二の主面の外郭に内接するよう、円形を成している。これにように構成されたレンズを、前記第二の主面上に設置し、前記レンズの外側から露出された前記第一の主面の突出部から下方のゲル状シリコーン樹脂の一部を前記縁部の上面までオーバーフローさせた後、７０℃温度下にて２時間、１００℃温度下にて２時間、さらに１５０℃温度下にて２時間、加熱し各部材を構造的一体化させる。

【００９０】このようにして得られた発光装置は、気泡等の混入物を有さず、優れた信頼性および光学特性を有している。

【００９１】（実施例２）図１０の如く、前記第二の主面の外郭が角取りされた六角形である以外は、実施例１と同様にして発光装置を形成すると、実施例１より量産性に優れ且つ密度高く実装することが可能な発光装置が得られる。

【００９２】（実施例３）図１１の如く、前記第二の主面の外郭および前記第一の主面の外郭は、それぞれ相似

をなす多角形であり、レンズは前記第一の主面の角が露出されるように外周部に切欠を有する以外は、実施例１と同様にして発光装置を形成すると、実施例１と同様の効果が得られる。

【００９３】（実施例４）剛性部材として用いるレンズを凸レンズ形状とする以外は実施例３と同様にして発光装置を形成すると、実施例１より正面光度が５０％向上される。

【００９４】（実施例５）レンズ内に、予め蛍光物質を含有させる以外は、実施例１と同様にして発光装置を形成する。

【００９５】ここで蛍光物質は、Ｙ、Ｇｄ、Ｃｅの希土類元素を化学量論比で酸に溶解した溶解液を蓚酸で共沈させる。これを焼成して得られる共沈酸化物と、酸化アルミニウムと混合して混合原料を得る。これにフラックスとしてフッ化バリウムを混合して坩堝に詰め、空気中１４００°Ｃの温度で３時間焼成して焼成品を得られる。焼成品を水中でボールミルして、洗浄、分離、乾燥、最後に篩を通して中心粒径が２２μｍである（$Y_{0.995}Gd_{0.005}$）$_2$ $_{.750}Al_5O_{12}$：$Ce_{0.250}$蛍光物質を形成する。

【００９６】このようにして得られた蛍光物質とバウダー状のシリカとを１：２の割合で混合させ、金型にて溶融硬化させて一括成型させる。このようにして得られた色変換型発光装置は、実施例１と同様な効果が得られ、信頼性が高く且つ高出力で白色光を発光することができる。

【００９７】（実施例６）ニトロセルロース９０ｗｔ％とγ－アルミナ１０ｗｔ％からなるスラリーに対して上記蛍光物質を５０ｗｔ％含有させ、剛性部材の背面に塗布し、２２０℃にて３０分間加熱硬化させることにより色変換部材を構成する以外は実施例５と同様にして発光装置を形成すると、実施例５と同様の効果が得られる。

【００９８】（実施例７）前記発光素子を、前記ゲル状シリコーン樹脂上に弾性シリコーン樹脂を塗布した後、レンズを載置する以外は実施例１と同様にして発光装置を形成すると、レンズの密着性が向上され、実施例１よりさらに信頼性の高い発光装置が得られる。

【００９９】（実施例８）前記ゲル状シリコーン樹脂中に、上記蛍光物質を５０ｗｔ％含有させる以外は実施例７と同様にして発光装置を形成すると、実施例５と同様の効果が得られる。

【０１００】（実施例９）前記発光素子を、上記蛍光物質が５０ｗｔ％含有されたシリカーゲルにて予め封止する以外は、実施例１と同様にして発光装置を形成すると、実施例５と同様の効果が得られる。

【０１０１】（実施例１０）前記発光素子の表面を、上記蛍光物質と$SiO_2$を有する連続した色変換層を、スプレーコーティングにより形成する以外は、実施例１と同様にして発光装置を形成する。ここで、前記色変換層



の形成方法について詳述する。

【０１０２】工程１．アルキルシリケートとしてメチルシリケート、エチルシリケート、Ｎ－プロピルシリケート、Ｎ－ブチルシリケート、が使用できるが、本実施例では、$SiO_2$を４０ｗｔ％含むエチルシリケートを縮合させた無色透明のオリゴマー液体を使用する。また、エチルシリケートは、予め触媒存在下において水と反応させて加水分解反応を起こしゾル化させたものを使用する。

【０１０３】まず、ゾル状エチルシリケートとエチレングリコールと蛍光物質とが、重量比が１：１：１の割合で混合された溶液を撹拌し塗布液を調整する。ここで、ゾル状エチルシリケートは乾燥しやすいため、ブタノール、エチレングリコールのような高沸点（１００℃～２００℃）の有機溶剤と混合することによりゲル化を防止することが好ましい。このように高沸点の有機溶剤と混合すると、ゾル状エチルシリケートのゲル化によるノズル先端部の目詰まりを防止し、作業効率を高めることができる。

【０１０４】工程２．上記塗布液を容器に入れ、循環ポンプによって塗布液を容器からノズルに輸送する。塗布液の流量はバルブによって調節する。ここで、ノズルから噴出される霧状の塗布液は、霧状で且つ螺旋状に回転されながら吹き付けられることを特徴とする。具体的には、ノズルの付近では円錐状に噴霧が広がり、ノズルから離れるにつれて円柱状に広がる。これにより、発光素子の上面、側面、および角部の全てを、膜厚がほぼ等しく且つ蛍光物質が均一に分散されてなる連続した色変換層にて覆うことができ、ブルーリング等の色むらを改善することができる。また、前記色変換層は一粒子層からなることが好ましく、これにより光の取り出し効率が向上される。本実施例では、発光素子の上面からノズル下端までの距離を４０～５０ｍｍとして円柱状に噴霧が広がった状態の所に発光素子の表面がくるように設置し、塗布液とガスとを発光素子の上面、側面および角、さらに凹部内平面上にほぼ均一な膜厚を有し連続した色変換層を形成する。

【０１０５】また、上記工程は、塗布する場所を加温した状態にて行うことを特徴とする。これにより、エチルシリケートのゾル化にて生成したエタノールや溶剤を、発光素子上に吹き付けた瞬時に飛ばすことができる。これにより、発光素子へ悪影響を与えることなく色変換層を設けることができる。本実施例では、ヒーター上パッケージを載置しながらスプレーコーティングしており、前記ヒーターの温度は５０℃以上３００℃以下の温度に調整されていることが好ましい。

【０１０６】工程３．工程２を行った後、室温で放置すると、ゾル状エチルシリケートと空気中の水分とが反応し、$SiO_2$により蛍光物質が固着される。

【０１０７】工程４．次に、３００℃の温度で２時間乾

燥させる。窒化物系発光素子は３５０℃以上の温度下に置かれると、発光素子としての性能が低下するため、３００℃の温度下で発光素子表面への固着が可能なアルキルシリケートは、蛍光物質の固着剤として好ましく用いることができる。

【０１０８】以上のように構成された発光装置は、全てが無機物にて構成されているため、高い放熱性と有すると共に近紫外や紫外線に対する耐光性にも優れている。本実施例の発光装置は、紫外域で発光する発光素子等、あらゆる素子を用いることができる。

【０１０９】（実施例１１）蛍光物質として、第一の蛍光物質（$Y_{0.8}Gd_{0.6}$）$_2Al_5O_{12}:Ce_{0.2}$と第二の蛍光物質$Ca_1Eu_{0.2}Si_5N_8$とを混合分散させたものを用いる以外は、実施例８と同様にして発光装置を形成すると、実施例８より演色性に優れた発光装置が得られる。本実施例で用いることができる前記第二の蛍光物質は特に限定されないが、前記第一の蛍光物質と励起波長が類似であり且つ黄色から赤色の蛍光を発光することが可能なMxSiyNz：Eu（但し、MはCa、Sr、Ba、およびZnの群から選択されたアルカリ土類金属の少なくとも一種、z＝（２／３）x＋（４／３）y）を用いると、優れた演色性を有する光が得られ好ましい。

【０１１０】具体的には、前記蛍光体は、L－M－N：R、またはL－M－O－N：R（LはBe、Mg、Ca、Sr、Ba、Znからなる群より選ばれる１種以上を含有する。MはC、Si、Ge、Sn、Ti、Zr、Hfからなる群より選ばれる１種以上を含有する。Nは窒素である。Oは酸素である。Rは希土類元素である。）で表される窒化物系蛍光体、が好ましく、さらには、$L_xM_yN_{((2/3)x+(4/3)y)}$：R、または$L_xM_yO_zN_{((2/3)x+(4/3)y-(2/3)z)}$：R（LはBe、Mg、Ca、Sr、Ba、Znからなる群より選ばれる１種以上を含有する。MはC、Si、Ge、Sn、Ti、Zr、Hfからなる群より選ばれる１種以上を含有する。Nは窒素である。Oは酸素である。Rは希土類元素である。）で表されかつ結晶構造を有する窒化物系蛍光体であることが好ましい。このような蛍光体を用いることにより暖色系の白色が発光可能な発光装置が得られる。

【０１１１】具体的に基本構成元素の例を挙げると、Mn、Bが添加された$Ca_2Si_5O_{0.1}N_{7.8}$：Eu、$Sr_2Si_5O_{0.1}N_{7.8}$：Eu、$(Ca_xSr_{1-x})_2Si_5O_{0.1}N_{7.8}$：Eu、$CaSi_7O_{0.3}N_{8.5}$：Eu、さらには希土類が添加された$Ca_2Si_5O_{0.8}N_{7.8}$：Eu、$Sr_2Si_5O_{0.5}N_{7.7}$：Eu、$(Ca_xSr_{1-x})_2Si_5O_{0.1}N_{7.8}$：Euなどがある。

【０１１２】さらに$Sr_2Si_5N_8$：Eu，Pr、$Ba_2Si_5N_8$：Eu，Pr、$Mg_2Si_5N_8$：Eu，Pr、$Zn_2Si_5N_8$：Eu，Pr、$SrSi_7N_{10}$：Eu，Pr、$BaSi_7N_{10}$：Eu，Ce、$MgSi_7N_{10}$：Eu，Ce、$ZnSi_7N_{10}$：Eu，Ce、$Sr_2Ge_5N_8$：Eu，Ce、$Ba_2Ge_5N_8$：Eu，Pr、$Mg_2Ge_5N_8$：Eu，Pr、$Zn_2Ge_5N_8$：Eu，Pr、$SrGe_7N_{10}$：Eu，Ce、$BaGe_7N_{10}$：Eu，Pr、$MgGe_7N_{10}$：Eu，Pr、$ZnGe_7N_{10}$：Eu，Ce、$Sr_{1.8}Ca_{0.2}Si_5N_8$：Eu，Pr，$Ba_{1.8}Ca_{0.2}Si_5N_8$：Eu，Ce，$Mg_{1.8}Ca_{0.2}Si_5N_8$：Eu，Pr，$Zn_{1.8}Ca_{0.2}Si_5N_8$：Eu，Ce，$Sr_{0.8}Ca_{0.2}Si_7N_{10}$：Eu，La，$Ba_{0.8}Ca_{0.2}Si_7N_{10}$：Eu，La，$Mg_{0.8}Ca_{0.2}Si_7N_{10}$：Eu，Nd，$Zn_{0.8}Ca_{0.2}Si_7N_{10}$：Eu，Nd，$Sr_{0.8}Ca_{0.2}Ge_7N_{10}$：Eu，Tb，$Ba_{0.8}Ca_{0.2}Ge_7N_{10}$：Eu，Tb，$Mg_{0.8}Ca_{0.2}Ge_7N_{10}$：Eu，Pr，$Zn_{0.8}Ca_{0.2}Ge_7N_{10}$：Eu，Pr，$Sr_{0.8}Ca_{0.2}Si_8GeN_{10}$：Eu，Pr，$Ba_{0.8}Ca_{0.2}Si_8GeN_{10}$：Eu，Pr，$Mg_{0.8}Ca_{0.2}Si_8GeN_{10}$：Eu，Y，$Zn_{0.8}Ca_{0.2}Si_8GeN_{10}$：Eu，Y，$Sr_2Si_5N_8$：Pr，$Ba_2Si_5N_8$：Pr，$Sr_2Si_5N_8$：Tb，$BaGe_7N_{10}$：Ceなどが製造できるが、これに限定されない。同様に、これらの一般式で記載された蛍光体に、所望に応じて第３成分、第４成分、第５成分等適宜、好適な元素を含有させることも当然考えられるものである。

【０１１３】（実施例１２）エチルシリケートの代わりに、フッ素樹脂（ＰＴＦＥ＝ポリテトラフルオロエチレン）を用いて塗布液を調整して蛍光体をバインドする以外は、実施例１１と同様の方法により発光装置を形成すると、実施例１１と同等の性能が得られ、かつ良好な製造歩留まりが得られる。

【０１１４】（実施例１３）発光素子として、主波長が４００ｎｍであるＬＥＤチップを用い、蛍光物質として$(Sr_{0.8}Eu_{0.1}Mn_{0.1})_{10}(PO_4)_6Cl_2$を用いる以外は実施例１１と同様にして発光装置を形成する。

【０１１５】ここで、上記蛍光物質の形成方法を述べる。まず、各原料である$SrHPO_4$、$SrCO_3$、$Eu_2O_3$、$MnCO_3$、$NH_4Cl$を上記組成比となるように調整し混合する。（$SrHPO_4$：１０００ｇ、$SrCO_3$：４８２．４ｇ、$Eu_2O_3$：１６．０ｇ、$MnCO_3$：３５．２ｇ、$NH_4Cl$：１１６．５ｇ）

【０１１６】次に、上記原料を秤量しボールミル等の混合機によって乾式で充分に混合する。この混合原料をＳｉＣ、石英、アルミナなどの坩堝に詰め、$N_2$、$H_2$の還元雰囲気中にて９６０℃／ｈｒで１２００℃まで昇温

し．恒温部１２００℃で３時間焼成する。得られた焼成品を水中で粉砕．分散、篩過、分離．水洗、乾燥して目的の蛍光体粉末を得る。

【０１１７】このようにして得られた蛍光物質を実施例１０と同様にして発光素子周囲及び凹部内平面に塗布し色変換層を形成すると、高輝度に発光可能な発光装置が得られる。

【０１１８】（実施例１４）原料として$CaHPO_4$、$CaCO_3$、$Eu_2O_3$．$MnCO_3$．$NH_4Cl$、および$NH_4Br$を用い$(Ca_{0.93}Eu_{0.05}Mn_{0.02})_{10}(PO_4)_6Br_{1.0}Cl_{1.0}$の組成比となるように調整．混合する。

【０１１９】上記原料を秤量しボールミル等の混合機によって乾式で充分に混合する。この混合原料をＳｉＣ、石英．アルミナなどの坩堝に詰め、$N_2$，$H_2$の還元雰囲気中にて９６０℃／ｈｒで１２００℃まで昇温し、恒温部１２００℃で３時間焼成する。得られた焼成品を水中で粉砕、分散．篩過、分離、水洗．乾燥して目的の蛍光体粉末を得る。この蛍光物質を用いた以外は実施例１３と同様にして発光素子周囲及び凹部内平面に塗布し色変換層を形成すると、高輝度に発光可能な発光装置が得られる。

【０１２０】（実施例１５）蛍光物質として、第一の蛍光物質$(Y_{0.995}Gd_{0.005})_{2.75}Al_5O_{12}:Ce_{0.25}$と第二の蛍光物質$(Ca_{0.8}Eu_{0.05}Mn_{0.02})_{10}(PO_4)_6Br_{1.0}Cl_{1.0}$とを混合分散させたものを用いる以外は．実施例１３と同様にして発光装置を形成すると、高輝度に発光可能な白色光源が得られる。

【０１２１】（実施例１６）$(Ca_{0.93}Eu_{0.05}Mn_{0.02})_{10}(PO_4)_6Br_{1.0}Cl_{1.0}$蛍光物質を$Al_2O_3$からなる塗布液を発光素子周囲及び凹部内平面に上記スプレーにて塗布し第一色変換層を形成した後、前記前記第一色変換層上に接して$(Y_{0.995}Gd_{0.005})_{2.75}Al_5O_{12}:Ce_{0.25}$蛍光物質を実施例１１と同様の方法にてゾル状エチルシリケートを用い$SiO_2$により固着されてなる第二色変換層を形成する以外は、実施例１４と同様にして発光装置を形成する。このようにして形成することにより、第二色変換層の光屈折率＜第一色変換層の光屈折率＜窒化ガリウム系化合物半導体層の屈折率とすることができ、発光素子からの光の取り出し効率が高まり高出力で発光することが可能な発光装置が得られる。

【０１２２】（実施例１７）ゲル状シリコーン樹脂１００重量％に対し．第一の蛍光物質$Y_{2.95}Al_5Ga_2O_{12}:Ce_{0.05}$を２０ｗｔ％および第二の蛍光物質$Ca_{1.5}Eu_{0.2}Si_5N_8$を５ｗｔ％混合分散させたものを柔軟性部材として用いる以外は、実施例１と同様にして発光装置を形成すると、色温度２７００Ｋの暖色系の白色光が得られる。



【０１２３】（実施例１８）図１２に示すように．第一の主面の隅部が第二の主面１ｃの外側からパッケージ外郭隅部に向かって露出した突出部を有し、該突出部はパッケージ外郭隅部に向かって末広がりとなる略台形形状に構成されなるパッケージを使用する以外は実施例１と同様にして発光装置を形成する。これにより、ゲル状シリコーン樹脂状にレンズを押しつけた際、パッケージの上面までゲル状シリコーン樹脂がオーバーフローすることを抑制することができる。前記突出部の数は特に限定されないが、パッケージの各隅部と対を成して形成すると．オーバーフロー効果をパッケージ全体に均一に行うことができる。

【０１２４】（実施例１９）図１７に示すように．第一の主面上に上面が底面よりも面積が小さい略円錐台を形成し．前記上面をレンズの支持面とする以外は．実施例１と同様にして発光装置を形成する。これにより．ゲル状シリコーン樹脂とレンズとの界面が熱膨張率差にて剥離することを抑制することができる。前記略円錐台は、等間隔に３つ以上形成されていることが好ましく．これによりさらに剥離防止効果が増大する。

【０１２５】（実施例２０）図１４に示すように．第一の主面上にかまぼこのような略半円柱を形成し．略半円柱の曲面の頂点ラインををレンズの支持ラインとするパッケージを使用する以外は．実施例１と同様にして発光装置を形成すると、実施例１９よりもさらに剥離防止効果を高めることができ、高い信頼性を有する発光装置が得られる。前記略半円柱は．前記略円錐台と同様に、等間隔に３つ以上形成されていることが好ましく．これによりさらに効果が増大する。

【０１２６】（実施例２１）図１９に示すような表面実装型発光装置を形成する。金属基体に設けられた凹部内に．サブマウントをＡｇペーストにて固定し、前記サブマウント９上に金属バンプを用いて発光素子をフリップチップ実装する以外は、実施例１と同様にして発光装置を形成すると．光学特性および信頼性が更に向上する。ここで、前記サブマウントは、シリコン半導体からなる保護素子や窒化アルミからなる金属基体等、種々のものを用いることができる。サブマウント自体が導電性を有する場合、$SiO_2$、ＳｉＮ等の絶縁膜を介して導電性パターンを積層したものを用いることができる。また、前記金属バンプの材料は．導通可能であれば特に限定されず．Ａｕバンプ、Ｓｎ－Ｐｂハンダバンプ、Ｚｎ－Ａｇハンダバンプ等を用いることができる。

【０１２７】

【発明の効果】本発明の発光装置は．発光素子が載置されたパッケージを、柔軟性を有する第一の封止部材と剛性を有する第二の封止部材にて密封する際、パッケージ内部から上方まで一貫した経路を設けることにより、前記第一の封止部材と前記第二の封止部材との間に気泡が

浸入することを抑制することができるとともに、一度第一の封止部材中に浸入されてしまった気泡をも効率よく脱泡することができる。

【図面の簡単な説明】

【図１】 図１は、本発明の発光装置を示す模式的平面図である。

【図２】 図２は、図１のII－II線における模式的断面図である。

【図３】 図３は、図１のIII－III線における模式的断面図である。

【図４】 図４は、図１のIV－IV線における模式的断面図である。

【図５】 図５は、実施例１０の発光装置を形成する一工程を示す模式的断面図である。

【図６】 図６は、実施例１０の発光装置を形成する一工程を示す模式的断面図である。

【図７】 図７は、実施例１０の発光装置を形成する一工程を示す模式的断面図である。

【図８】 図８は、実施例１０の発光装置を形成する一工程を示す模式的断面図である。

【図９】 図９は、本発明の他の発光装置を示す模式的断面図である。

【図１０】 図１０は、本発明の他の発光装置を示す模式的断面図である。

【図１１】 図１１は、本発明の他の発光装置を示す模式的断面図である。

【図１２】 図１２は、本発明の他の発光装置を示す模式的断面図である。

【図１３】 図１３は、図１２のXIII－XIII線における模式的断面図である。

【図１４】 図１４は、本発明の他の発光装置を示す模式的断面図である。



＊【図１５】 図１５は、図１４のXV－XV線における模式的断面図である。

【図１６】 図１６は、本発明の他の発光装置を示す模式的断面図である。

【図１７】 図１７は、本発明の他の発光装置を示す模式的断面図である。

【図１８】 図１８は、図１７のXVIII－XVIII線における模式的断面図であるである。

【図１９】 図１９は、本発明の他の発光装置を示す模式的断面図である。

【図２０】 図２０は、図１９のXX－XX線における模式的断面図である。

【図２１】 図２１は、本発明の他の発光装置を示す模式的断面図である。

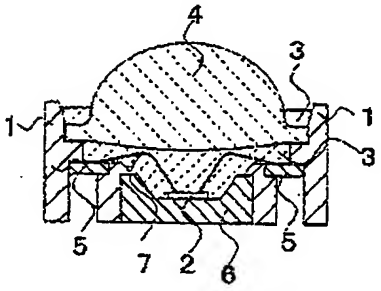
【図２２】 図２２は、図２１のXXII－XXII線における模式的断面図である。

【図２３】 図２３は、本発明と比較のために示す発光装置の模式的断面図である。

【符号の説明】

１・・・パッケージ
１ａ・・・パッケージ凹部
１ｂ・・・第一の主面
１ｃ・・・第二の主面
１ｄ・・・第三の主面
２・・・発光素子チップ
３・・・柔軟性部材
４・・・剛性部材
５・・・リード電極
６・・・金属基体
７・・・ワイヤ
８・・・蛍光物質
９・・・サブマウント

【図２】

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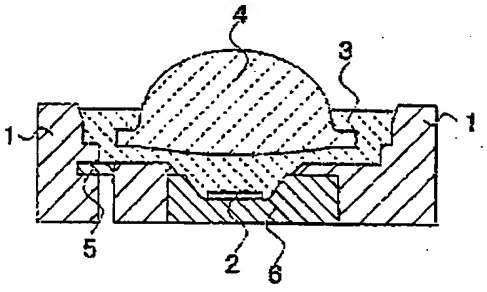

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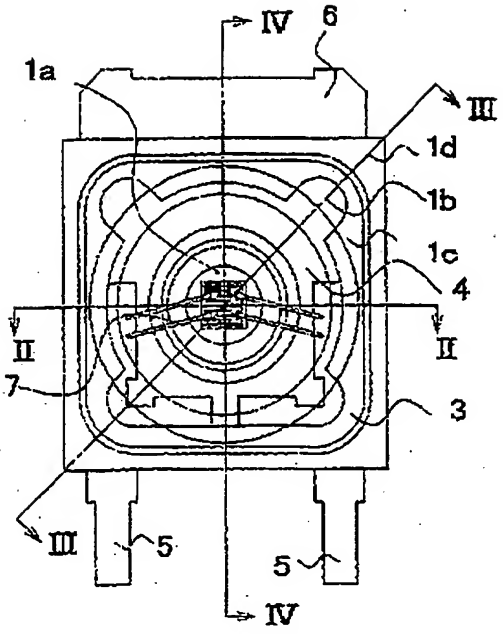


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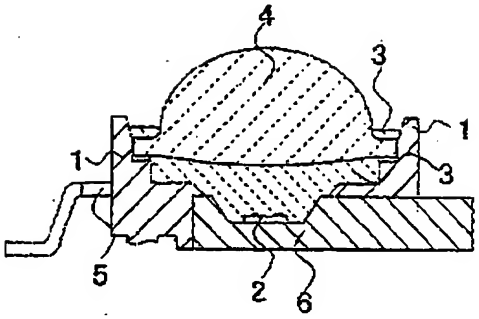


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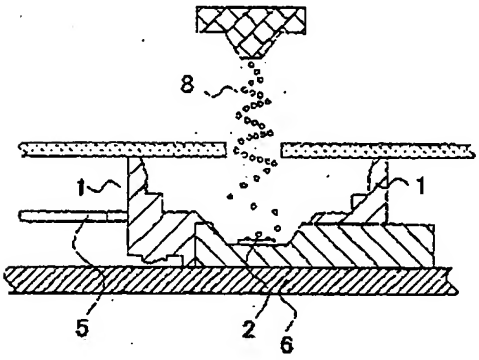


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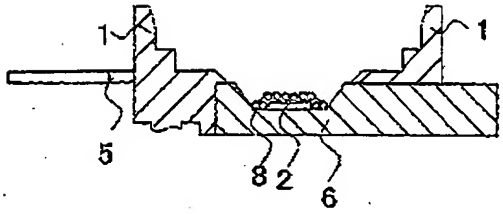


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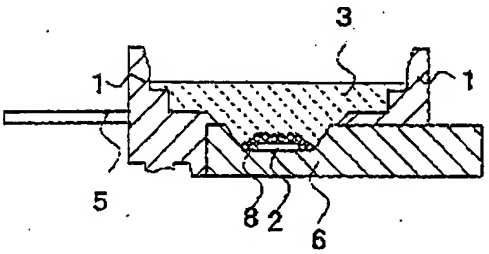


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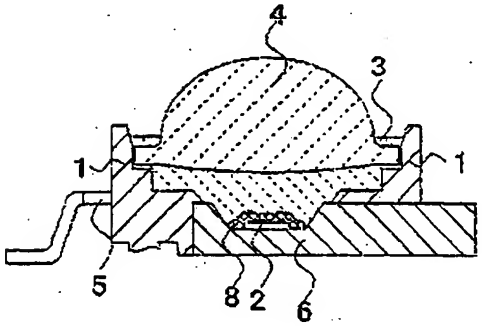

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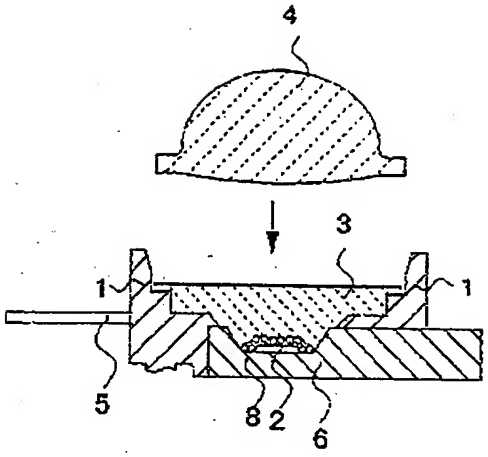


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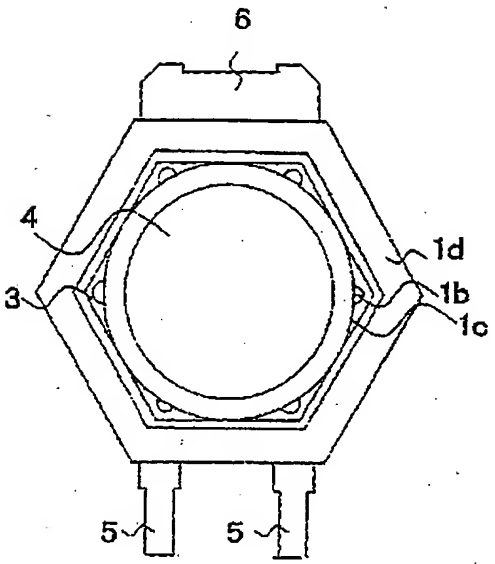


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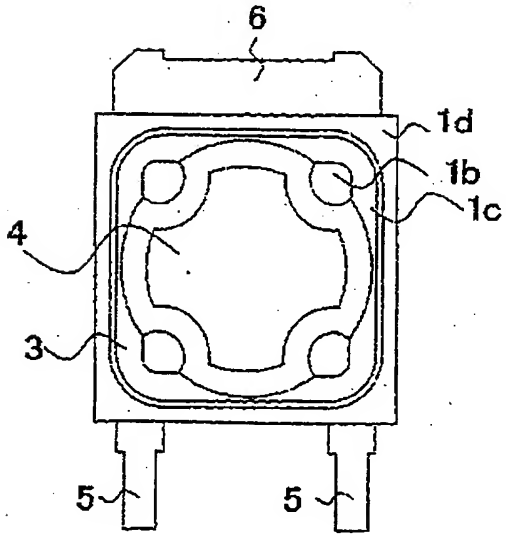


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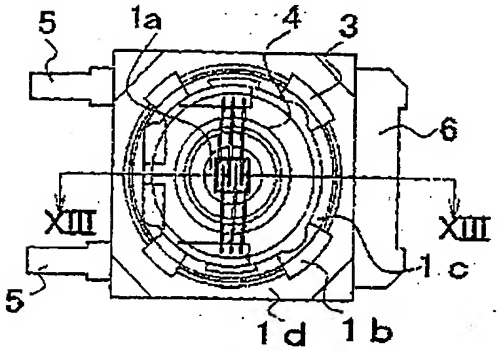


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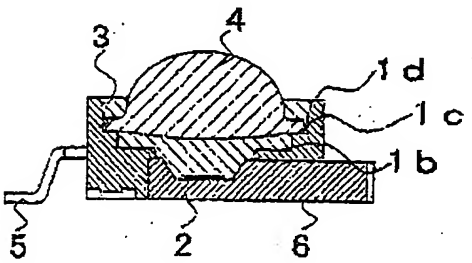

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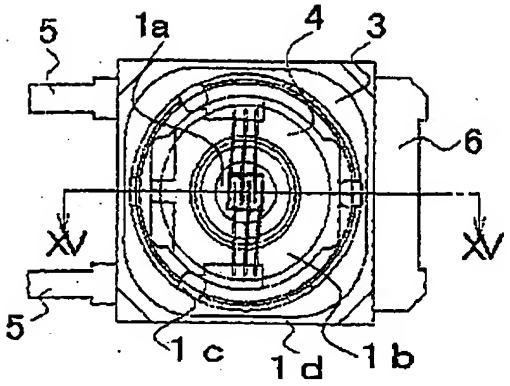


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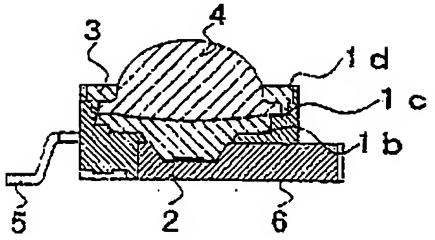


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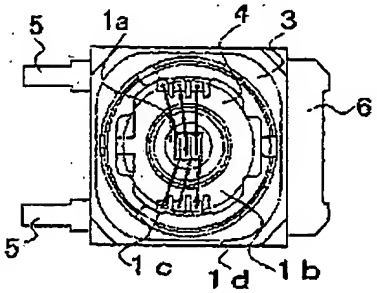


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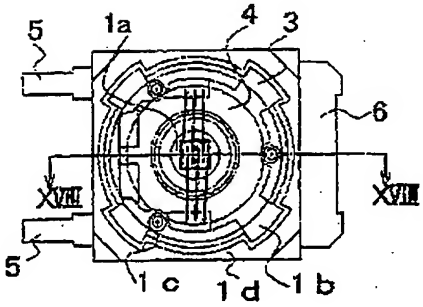


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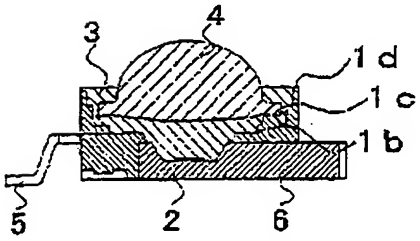


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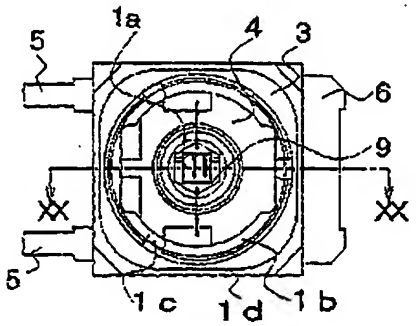

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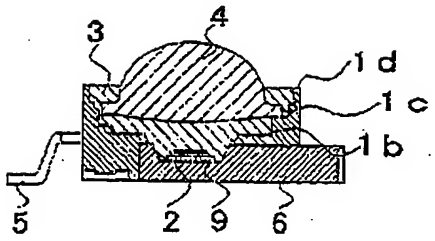


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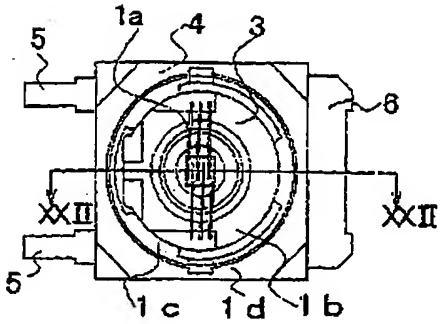


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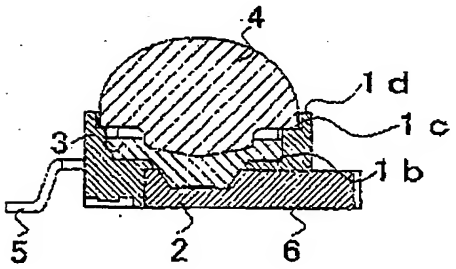


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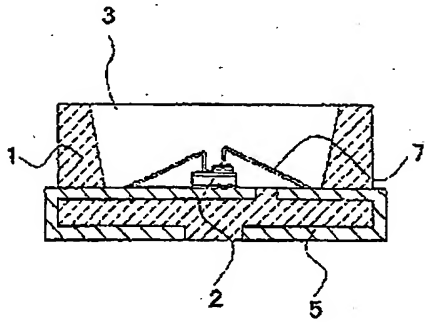

## TECHNICAL FIELD

[Field of the Invention] This invention relates to the luminescence equipment which served both as good dependability and a good optical property especially with respect to the luminescence equipment used for the various light sources, such as the back light light source, a display, and lighting, or a photosensor.

[Translation done.]

## TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, when the member which has flexibility like the above is closed in a rigid member, in case it closes, it is in the inclination for air bubbles to be easy to be mixed in a flexibility member. If it seals in the rigid member which consists of a metal which does not pass a gas especially, glass, etc., the rigid member which it becomes impossible for the flexibility member by which thermal stability was spoiled with said air bubbles to ease thermal stress, and it adjoins may be damaged. Moreover, when air bubbles contain in the interface of a flexibility member and a rigid member, said air bubbles originate, these interfaces exfoliate, an air space is formed, and the fall of a radiant power output and fluctuation of an optical property arise.
[0010] Then, this invention solves the above-mentioned technical problem, and offers the luminescence equipment which has the optical property which has high dependability and was stabilized.

[Translation done.]

## EFFECT OF THE INVENTION

[Effect of the Invention] The luminescence equipment of this invention is establishing the path which was consistent from the interior of a package to the upper part, in case it seals in the first closure member which has flexibility for the package with which the light emitting device's was laid, and the second closure member which has rigidity, While being able to control that air bubbles mix between said first closure member and said second closure member, degassing also of the air bubbles once mixed into the first closure member can be carried out efficiently.

[Translation done.]

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PRIOR ART

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[Description of the Prior Art] High brightness, a high power semi-conductor light emitting device, small, and high sensitivity luminescence equipment are developed, and it is used for various fields today. Such luminescence equipment is used for the light source of an optical printer head, the liquid crystal back light light source, the light source of various meter, various reading sensors, etc. taking advantage of the low power and which small and lightweight description.
[0003] As an example of such luminescence equipment, the **** luminescence equipment shown in drawing 23 is mentioned. While carrying out die bond of the LED chip as a light emitting device on the lead electrode 2 exposed from the base in said crevice using the plastic package 5 which it has a crevice, and the lead electrode was inserted, and was really fabricated, each electrode of an LED chip and the lead electrode prepared in the package are electrically connected by a gold streak etc. Thus, the closure of the LED chip arranged in a crevice is carried out after hardening by the translucency member which has rigidity. An LED chip, a wire, etc. which have been arranged inside a package can be protected from external environments, such as moisture and external force, by this, and the luminescence equipment which has very high dependability is obtained.
[0004] However, such luminescence equipment is beginning to be used by the severer environmental condition from the breadth of a field of the invention. With the luminescence equipment used for the aircraft or mount, it may change with outside air temperature, for example to -20 degrees C or less +80 degrees C or more. Moreover, an outside atmospheric pressure, a thermal shock, etc. and coincidence also have vibration. In such a case, each configuration member will repeat expansion and contraction with thermal stress, each structural integrity becomes weak, and has a bad influence on an optical property, and also dependability will fall. Moreover, in current [ for which the light emitting device which can emit light in high brightness in a near-ultraviolet field is developed and used ], it is important to control degradation of each part material by the light of the above-mentioned field.
[0005] Then, the resin which has siloxane association which is not cut by light attracts attention in recent years. Such resin has the lightfastness which was excellent to the wavelength of the above-mentioned field, and also flexibility has high stability to heat highly.
[0006] However, by having flexibility, a front face is also elasticity, and a mechanical strength is weak and unsuitable as sheathing of luminescence equipment. Moreover, since it has tuck nature on a front face and a foreign matter adheres, as a luminescence side, it is unsuitable.
[0007] Then, the luminescence equipment which it comes to cover with rigid covering which equipped JP,2000-150968,A with the member which has flexibility inside a cavity wall and was excellent in lightfastness in the light emitting device laid on the above-mentioned metal base using the package excellent in heat dissipation nature is indicated. Thus, the constituted luminescence equipment becomes possible [ having the outstanding thermal resistance, lightfastness, and a mechanical strength from the outside ].
[0008]
[Patent reference 1] JP,2000-150968,A

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[Translation done.]

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the typical top view showing the luminescence equipment of this invention.
[Drawing 2] Drawing 2 is a typical sectional view in the II-II line of drawing 1 .
[Drawing 3] Drawing 3 is a typical sectional view in the III-III line of drawing 1 .
[Drawing 4] Drawing 4 is a typical sectional view in the IV-IV line of drawing 1 .
[Drawing 5] Drawing 5 is the typical sectional view showing one process which forms the luminescence equipment of an example 10.
[Drawing 6] Drawing 6 is the typical sectional view showing one process which forms the luminescence equipment of an example 10.
[Drawing 7] Drawing 7 is the typical sectional view showing one process which forms the luminescence equipment of an example 10.
[Drawing 8] Drawing 8 is the typical sectional view showing one process which forms the luminescence equipment of an example 10.
[Drawing 9] Drawing 9 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 10] Drawing 10 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 11] Drawing 11 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 12] Drawing 12 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 13] Drawing 13 is a typical sectional view in the XIII-XIII line of drawing 12 .
[Drawing 14] Drawing 14 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 15] Drawing 15 is a typical sectional view in the XV-XV line of drawing 14 .
[Drawing 16] Drawing 16 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 17] Drawing 17 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 18] drawing 18 is a typical sectional view in the XVIII-XVIII line of drawing 17 -- it comes out.
[Drawing 19] Drawing 19 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 20] Drawing 20 is a typical sectional view in the XX-XX line of drawing 19 .
[Drawing 21] Drawing 21 is the typical sectional view showing other luminescence equipments of this invention.
[Drawing 22] Drawing 22 is a typical sectional view in the XXII-XXII line of drawing 21 .
[Drawing 23] Drawing 23 is the typical sectional view of the luminescence equipment shown for this invention and a comparison.
[Description of Notations]
1 ... Package
1a ... Package crevice
1b ... The first principal plane

1c ... The second principal plane
1d ... The third principal plane
2 ... Light emitting device chip
3 ... Flexibility member
4 ... Rigid member
5 ... Lead electrode
6 ... Metal base
7 ... Wire
8 ... Fluorescent material
9 ... Submounting

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[Translation done.]

## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the luminescence equipment which served both as good dependability and a good optical property especially with respect to the luminescence equipment used for the various light sources, such as the back light light source, a display, and lighting, or a photosensor.

[0002]
[Description of the Prior Art] High brightness, a high power semi-conductor light emitting device, small, and high sensitivity luminescence equipment are developed, and it is used for various fields today. Such luminescence equipment is used for the light source of an optical printer head, the liquid crystal back light light source, the light source of various meter, various reading sensors, etc. taking advantage of the low power and which small and lightweight description.
[0003] As an example of such luminescence equipment, the **** luminescence equipment shown in drawing 23 is mentioned. While carrying out die bond of the LED chip as a light emitting device on the lead electrode 2 exposed from the base in said crevice using the plastic package 5 which it has a crevice, and the lead electrode was inserted, and was really fabricated, each electrode of an LED chip and the lead electrode prepared in the package are electrically connected by a gold streak etc. Thus, the closure of the LED chip arranged in a crevice is carried out after hardening by the translucency member which has rigidity. An LED chip, a wire, etc. which have been arranged inside a package can be protected from external environments, such as moisture and external force, by this, and the luminescence equipment which has very high dependability is obtained.
[0004] However, such luminescence equipment is beginning to be used by the severer environmental condition from the breadth of a field of the invention. With the luminescence equipment used for the aircraft or mount, it may change with outside air temperature, for example to -20 degrees C or less +80 degrees C or more. Moreover, an outside atmospheric pressure, a thermal shock, etc. and coincidence also have vibration. In such a case, each configuration member will repeat expansion and contraction with thermal stress, each structural integrity becomes weak, and has a bad influence on an optical property, and also dependability will fall. Moreover, in current [ for which the light emitting device which can emit light in high brightness in a near-ultraviolet field is developed and used ], it is important to control degradation of each part material by the light of the above-mentioned field.
[0005] Then, the resin which has siloxane association which is not cut by light attracts attention in recent years. Such resin has the lightfastness which was excellent to the wavelength of the above-mentioned field, and also flexibility has high stability to heat highly.
[0006] However, by having flexibility, a front face is also elasticity, and a mechanical strength is weak and unsuitable as sheathing of luminescence equipment. Moreover, since it has tuck nature on a front face and a foreign matter adheres, as a luminescence side, it is unsuitable.
[0007] Then, the luminescence equipment which it comes to cover with rigid covering which equipped JP,2000-150968,A with the member which has flexibility inside a cavity wall and was excellent in lightfastness in the light emitting device laid on the above-mentioned metal base using the package excellent in heat dissipation nature is indicated. Thus, the constituted luminescence equipment becomes possible [ having the outstanding thermal resistance, lightfastness, and a mechanical strength from the outside ].
[0008]

[Patent reference 1] JP,2000-150968,A [0009]
[Problem(s) to be Solved by the Invention] However, when the member which has flexibility like the above is closed in a rigid member, in case it closes, it is in the inclination for air bubbles to be easy to be mixed in a flexibility member. If it seals in the rigid member which consists of a metal which does not pass a gas especially, glass, etc., the rigid member which it becomes impossible for the flexibility member by which thermal stability was spoiled with said air bubbles to ease thermal stress, and it adjoins may be damaged. Moreover, when air bubbles contain in the interface of a flexibility member and a rigid member, said air bubbles originate, these interfaces exfoliate, an air space is formed, and the fall of a radiant power output and fluctuation of an optical property arise.
[0010] Then, this invention solves the above-mentioned technical problem, and offers the luminescence equipment which has the optical property which has high dependability and was stabilized.
[0011]
[The means for solving invention] That is, the luminescence equipment of this invention is luminescence equipment which has a light emitting device chip, the translucency flexible member which covers this light emitting device chip, and the translucency rigidity member laid above this flexibility member, and said translucency member has a principal plane and a tooth back, and it is characterized by having projected said tooth back in said direction of a light emitting device.
[0012] If the laminating of the light emitting device chip is carried out and a flexibility member and a rigid member are closed, air bubbles will be easy to be mixed from these interfaces. Since integrity will be spoiled by volatilization explosion of air bubbles if it becomes the bottom of an elevated temperature, the luminescence equipment with which air bubbles exist cannot give reflow mounting which can be soldered to a mounting substrate etc. at once, but is deficient in mass-production nature. On the other hand, by specifying the configuration of a rigid member, the luminescence equipment of the invention in this application solves the above-mentioned problem, has the high dependability which can carry out reflow mounting, and can be dealt also with Pb free mounting.
[0013] Although the cross-section configuration of said tooth back will not be limited especially if it has projected in said direction of a light emitting device, its prevention effectiveness of cellular mixing by it being the V character mold which is in contact with said light emitting device in one point recently rises and is desirable.
[0014] Moreover, in the whole interface, mixing of air bubbles can be efficiently prevented as said one point is a center section in said tooth back. Moreover, said tooth back is made into a curved surface, and if a pressure is applied to a flexibility member at the tooth back which has such a configuration, while the drift velocity of said flexibility member is accelerated, the degassing effect of air bubbles can be heightened. Thereby, reliable luminescence equipment can be formed with sufficient mass-production nature. Moreover, adhesion with a downward flexibility member improves and it is desirable. Moreover, if said tooth back is made into a convex configuration, it can control that a flexibility member overflows to the principal plane side of a rigid member.
[0015] Moreover, the lower limit of said rigid member has the flange which spreads outside, and the side face and principal plane of this flange are characterized by being covered with said flexibility member. Thus, installation of a rigid member is easy-ized by preparing a flange. Moreover, adhesion with a flexibility member improves, and dependability can be raised, without having a bad influence on an optical property.
[0016] It has the package which contains said light emitting device chip in the crevice in which it was prepared on the front face. Moreover, said package The first principal plane which spreads toward an outside in said first crevice upper part at least, It has the second principal plane which spreads outside from this first principal plane in the upper part, and the third principal plane which serves as the exterior of a breadth package from this second principal plane outside in the upper part. Said flexibility member It is characterized by being continuously prepared over said first principal plane, said second principal plane, and the lower limit section of said rigid member. The integrity of each part material can be maintained by this, without using adhesives separately, and luminescence equipment excellent in dependability is obtained. On the other hand, if each part material is pasted up with a small amount of adhesives etc., although photodegradation will be carried out, it will originate in this and dependability will fall, locally, heat deterioration and by considering as the above-mentioned configuration, said adhesives etc. would prevent local degradation and will have realized reinforcement of luminescence equipment.
[0017] Moreover, said second principal plane is a principal plane of each at least three or more

susceptors estranged and prepared on said first principal plane, and, as for one tooth back of said rigid member, it is desirable that it is in contact with said second principal plane. Even if it is used under a severe environment by such configuration and exfoliation arises in a rigid member and a flexibility member, an exfoliation part can be controlled near [ said ] susceptor and an optical property can be maintained.

[0018] Moreover, in the outline of said second principal plane, said rigid member has at least three or more contacts, and is inscribed in, and, as for said the first principal plane and said second principal plane, it is desirable to have an outcrop in each exterior between contacts of the ******** aforementioned rigidity member. Thus , the constituted luminescence equipment use the pressure apply in case a rigid member be lay on a flexibility member , can emit to the exterior the air bubbles which mixed in the inside of a flexibility member , or the interface of a flexibility member and a rigid member according to an operation of the outcrop of the rigid member positioned with a sufficient precision by said second principal plane , and said first principal plane , and can obtain the luminescence equipment which have high dependability and the stable optical property by easy technique with the sufficient yield . In the condition of having been applied before hardening, the front face of said flexibility member serves as a configuration in which a center section has a convex up with surface tension in many cases, and can perform a degassing operation of air bubbles in the whole flexibility member by putting a pressure by one tooth back and making these heights flow by the package crevice. Moreover, the luminescence equipment of this invention uses the flexibility member overflowed in the case of said degassing operation, and is a rigid member and really [ said ] molding-ized. Moreover, as for the principal plane of a rigid member, it is desirable to have a tooth back and the curved surface projected to the opposite side. The luminescence side which has such a configuration condenses the light by which reflective dispersion was carried out with the wall of a crevice, and can raise the brightness in the direction of a transverse plane. Since incidence especially of the tooth back which has the curved surface projected in the direction of a crevice like the above is carried out into a rigid member after light has diffused, it is desirable to establish a tooth back and the curved surface projected to the opposite side in a principal plane side, and to make light condense.

[0019] The lower limit of said rigid member has the flange which spreads outside, and the side face and principal plane of this flange are covered with said flexibility member. Furthermore, the tooth back of said flange It is desirable for it to be parallel to said second principal plane, and to have countered, the positioning accuracy of a rigid member and said second principal plane improves by this, and reliable luminescence equipment can be offered with sufficient mass-production nature, without producing gap of an optical axis between each luminescence equipment.

[0020] Moreover, if the outline of the second principal plane is made into the polygon which has many angles from the outline of said rigid member, the small luminescence equipment which can carry out high density assembly will be obtained.

[0021] Moreover, if the outline of a rigid member wears R in said contact, the rate which makes a flexibility member overflow to the second principal plane is accelerated, and a rigid member can be fixed quickly. The stress applied to a flexibility member becomes strong by this, a degassing operation improves, and dependability increases. Furthermore, the flexibility member prepared in said second principal plane and the rigid member lower limit section, applying serves as a gently-sloping and flat principal plane, and a desirable appearance is acquired.

[0022] Moreover, in said first principal plane, said outcrop is characterized by being the heights projected outside the central field. By considering as such a configuration, a flexibility member can be efficiently flowed to the second principal plane and the rigid member lower limit section good. Moreover, when a flexibility member collides with said heights wall surface, a degassing operation of a flexibility member improves. If said heights have countered with the angle of said second principal plane, they can form the flexibility member which has equal thickness on the outcrop of said second principal plane, and can strengthen structural integrity. Moreover, if R wears the tip of said heights, effectiveness will increase further.

[0023] Moreover, when the lead electrode of a pair is inserted and a package is really fabricated by shaping resin from a side face, as for the inner section of said lead electrode, it is desirable to be exposed along with the outline of this first principal plane in said first principal plane. Since the front face of a lead electrode is a metal, it is thought that the fluidity of a flexibility member is excellent. Although it has high dependability by considering this invention as the configuration which is made to carry out the collision counteraction of the flexibility member by each side attachment wall of a package, and is made

to flow upwards, if a lead electrode is prepared in accordance with the side attachment wall with which said collision counteraction is performed, the collision reactionary rate of a flexibility member will be accelerated and the effectiveness of a degassing operation of air bubbles will be strengthened.
[0024] Moreover, as for the inner section of a lead electrode, it can be desirable to be dissociated and prepared in the two directions of inside from the outcrop of said first principal plane, and, thereby, it can raise the above-mentioned effectiveness further. Moreover, the omission of the really fabricated lead electrode is prevented. Moreover, when other components need to be laid, and it lays between each separation branch lead and is made to connect electrically, a protection component etc. can lay said component in the location which does not participate in a luminescence observation side, and is desirable.
[0025] Moreover, as for the inner section of a lead electrode, it is desirable to have exposed from the micropore which on the back [ a part of ] penetrated from the package tooth-back side. The stress of the lead electrode which wins popularity in case this lays the time of wirebonding being carried out and a rigid member can be softened. Thereby, the structural unification with a lead electrode and each part material can be strengthened.
[0026] Moreover, a package has the metal base with which a tooth back turns into a component side, as for the principal plane of this metal base, it is desirable that it is exposed from said crevice base and said light emitting device is laid, thereby, heat can be radiated to a mounting substrate good in the heat produced from a light emitting device, and the dependability of the flexibility member which covers a light emitting device can be raised. Moreover, the fluidity of a downward flexible member can be improved on said metal base front face, and local degradation near the light emitting device can be prevented.
[0027] Moreover, as for said metal base, it is desirable that it was inserted from the direction of a side face, and was really fabricated with said lead electrode by said shaping resin, and the end section has projected from said package side face. Thus, by constituting, a touch area with the open air of a metal base can raise the heat dissipation nature of increase and luminescence equipment.
[0028] Moreover, as for a metal base, it is desirable to have the first principal plane exposed from said crevice and the second principal plane buried in said package, and, thereby, its structural integrity of luminescence equipment improves.
[0029] moreover, the center section of the principal plane of the metal base exposed from said crevice base -- the second crevice -- preparing -- this -- if a light emitting device is laid in the second crevice base, the ejection effectiveness of the light which emits light from a light emitting device end face will improve, and also the flexibility member fluidity near the light emitting device at the time of cellular mixing prevention into a flexibility member, a degassing operation of the mixed air bubbles, and luminescence equipment use improves. Moreover, a touch area with the metal base used as a flexibility member and a heat dissipation path becomes large, and partial degradation of a flexibility member can be prevented.
[0030] Moreover, as for the end section of the lead electrode of a pair, it is more desirable than the side face in which the end section of a metal base was exposed, and the side face of the opposite side to have separated a predetermined distance and to have exposed to juxtaposition. Thereby, electrode wiring of a mounting substrate can be simplified. Moreover, luminescence equipment can be formed in a miniaturization, maintaining the tooth-back area of a metal base. Furthermore, even when there are too many conductive members prepared in the tooth back of a metal base in the tooth back of a package by preparing a notch in the side-face side of the above-mentioned opposite side, it can prevent that even the lead electrode which limits in said notch and counters flows out that said conductive member flows out in the direction of a lead electrode, and the yield improves.
[0031] Moreover, when a light emitting device has the electrode of a positive/negative pair in the same flat-surface side and the bridge is constructed over the electrode of this positive/negative pair with the inner section and the wire of a lead electrode of said pair, respectively, as for the top-most vertices of said wire, it is desirable to be arranged between said first principal plane and said second principal plane. Thus, while the fluidity of a flexibility member improves by preparing a wire, effect of the thermal stress concerning a wire can be made into the minimum. moreover -- since it does not have the failure which the lead electrode has been arranged more nearly up than each electrode of a light emitting device, and was projected upwards to the shunt of the wire from a light emitting device to a lead electrode -- a wirebonding activity -- comparatively -- easy -- and dependability -- it can carry out highly.

[0032] Moreover, what is necessary is just to contain said fluorescent material in at least one layer, when considering as a configuration in the laminated structure which is possible also for making said flexibility member contain a fluorescent material, and consists said flexibility member of at least two or more layers.
[0033]
[Embodiment of the Invention] As a result of various experiments, when this invention person covers a light emitting device chip with a flexibility member and a rigid member, by specifying the configuration of a rigid member member, he finds out that the above-mentioned problem is solvable, and came to accomplish this invention. Hereafter, each configuration of this invention is explained in full detail.
[0034] (Package 1) In the metal mold which the metal base which serves as a forward lead electrode, the negative lead electrode 5, and a heat sink as shown in drawing 1 was inserted from the side face which countered, respectively, and was closed, from the gate in an inferior-surface-of-tongue side, a package slushes the shaping resin by which melting was carried out, hardens, and is formed.
[0035] If it explains to a detail, the package would have the first crevice in the principal plane side, and the principal plane of the metal base 6 inserted from one side face of said package will have exposed it from this crevice base. The second crevice which can contain a light emitting device is established in the principal plane of said metal base 6.
[0036] On the other hand, the first principal plane which spreads outside [ above said first crevice ], and the second principal plane which spreads outside [ above said first principal plane ] are prepared. The principal plane of the lead electrode of a positive/negative pair inserted from one side face of said package and the side face of another side which countered is exposed from said first principal plane. The principal plane of said lead electrode is electrically connected with each electrode of said light emitting device with the wire, respectively. Moreover, said second principal plane has constituted the role of positioning of the rigid member laid up.
[0037] Using the package which has such a configuration, a light emitting device is electrically connected to the crevice base of said package, these are sealed in the rigid member which is the flexibility member and the second closure member which are the first closure member, and the luminescence equipment of this invention is obtained.
[0038] As for other lead electrode principal planes, it is [ that an area required to fix each electrode of said light emitting device chip and the electric conduction wire over which a bridge is constructed has just exposed the lead electrode principal plane exposed in said first crevice here ] desirable like drawing 16 to be covered with the same ingredient as package resin. Thereby, the evaporation expansion produced in the interface of a lead electrode and the first closure member can be controlled. Moreover, from enlarging the touch area of the strong package shaping resin and the closure member of adhesion comparatively, the integrity of luminescence equipment is raised and luminescence equipment with high optical property and dependability is obtained.
[0039] The package of the gestalt of this operation here is made into the configuration where a part of said first principal plane and said second principal plane can be exposed outside from said second closure member. with the gestalt of this operation, the closure member of ** the second whose an outline it supposes that it is square and is a circle in this rectangular head which picked R in the outer wall of the second principal plane is inscribed in -- having -- this -- the both sides of the edge of said second principal plane and the edge of said first principal plane have exposed on four peripheries of the second closure member.

## MEANS

[The means for solving invention] That is, the luminescence equipment of this invention is luminescence equipment which has a light emitting device chip, the translucency flexible member which covers this light emitting device chip, and the translucency rigidity member laid above this flexibility member, and said translucency member has a principal plane and a tooth back, and it is characterized by having projected said tooth back in said direction of a light emitting device.
[0012] If the laminating of the light emitting device chip is carried out and a flexibility member and a rigid member are closed, air bubbles will be easy to be mixed from these interfaces. Since integrity will be spoiled by volatilization explosion of air bubbles if it becomes the bottom of an elevated temperature, the luminescence equipment with which air bubbles exist cannot give reflow mounting which can be soldered to a mounting substrate etc. at once, but is deficient in mass-production nature. On the other hand, by specifying the configuration of a rigid member, the luminescence equipment of the invention in this application solves the above-mentioned problem, has the high dependability which can carry out reflow mounting, and can be dealt also with Pb free mounting.
[0013] Although the cross-section configuration of said tooth back will not be limited especially if it has projected in said direction of a light emitting device, its prevention effectiveness of cellular mixing by it being the V character mold which is in contact with said light emitting device in one point recently rises and is desirable.
[0014] Moreover, in the whole interface, mixing of air bubbles can be efficiently prevented as said one point is a center section in said tooth back. Moreover, said tooth back is made into a curved surface, and if a pressure is applied to a flexibility member at the tooth back which has such a configuration, while the drift velocity of said flexibility member is accelerated, the degassing effect of air bubbles can be heightened. Thereby, reliable luminescence equipment can be formed with sufficient mass-production nature. Moreover, adhesion with a downward flexibility member improves and it is desirable. Moreover, if said tooth back is made into a convex configuration, it can control that a flexibility member overflows to the principal plane side of a rigid member.
[0015] Moreover, the lower limit of said rigid member has the flange which spreads outside, and the side face and principal plane of this flange are characterized by being covered with said flexibility member. Thus, installation of a rigid member is easy-ized by preparing a flange. Moreover, adhesion with a flexibility member improves, and dependability can be raised, without having a bad influence on an optical property.
[0016] It has the package which contains said light emitting device chip in the crevice in which it was prepared on the front face. Moreover, said package The first principal plane which spreads toward an outside in said first crevice upper part at least, It has the second principal plane which spreads outside from this first principal plane in the upper part, and the third principal plane which serves as the exterior of a breadth package from this second principal plane outside in the upper part. Said flexibility member It is characterized by being continuously prepared over said first principal plane, said second principal plane, and the lower limit section of said rigid member. The integrity of each part material can be maintained by this, without using adhesives separately, and luminescence equipment excellent in dependability is obtained. On the other hand, if each part material is pasted up with a small amount of adhesives etc., although photodegradation will be carried out, it will originate in this and dependability will fall, locally, heat deterioration and by considering as the above-mentioned configuration, said adhesives etc. would prevent local degradation and will have realized reinforcement of luminescence equipment.

[0017] Moreover, said second principal plane is a principal plane of each at least three or more susceptors estranged and prepared on said first principal plane, and, as for one tooth back of said rigid member, it is desirable that it is in contact with said second principal plane. Even if it is used under a severe environment by such configuration and exfoliation arises in a rigid member and a flexibility member, an exfoliation part can be controlled near [ said ] susceptor and an optical property can be maintained.
[0018] Moreover, in the outline of said second principal plane, said rigid member has at least three or more contacts, and is inscribed in, and, as for said the first principal plane and said second principal plane, it is desirable to have an outcrop in each exterior between contacts of the ******** aforementioned rigidity member. Thus , the constituted luminescence equipment use the pressure apply in case a rigid member be lay on a flexibility member , can emit to the exterior the air bubbles which mixed in the inside of a flexibility member , or the interface of a flexibility member and a rigid member according to an operation of the outcrop of the rigid member positioned with a sufficient precision by said second principal plane , and said first principal plane , and can obtain the luminescence equipment which have high dependability and the stable optical property by easy technique with the sufficient yield . In the condition of having been applied before hardening, the front face of said flexibility member serves as a configuration in which a center section has a convex up with surface tension in many cases, and can perform a degassing operation of air bubbles in the whole flexibility member by putting a pressure by one tooth back and making these heights flow by the package crevice. Moreover, the luminescence equipment of this invention uses the flexibility member overflowed in the case of said degassing operation, and is a rigid member and really [ said ] molding-ized. Moreover, as for the principal plane of a rigid member, it is desirable to have a tooth back and the curved surface projected to the opposite side. The luminescence side which has such a configuration condenses the light by which reflective dispersion was carried out with the wall of a crevice, and can raise the brightness in the direction of a transverse plane. Since incidence especially of the tooth back which has the curved surface projected in the direction of a crevice like the above is carried out into a rigid member after light has diffused, it is desirable to establish a tooth back and the curved surface projected to the opposite side in a principal plane side, and to make light condense.
[0019] The lower limit of said rigid member has the flange which spreads outside, and the side face and principal plane of this flange are covered with said flexibility member. Furthermore, the tooth back of said flange It is desirable for it to be parallel to said second principal plane, and to have countered, the positioning accuracy of a rigid member and said second principal plane improves by this, and reliable luminescence equipment can be offered with sufficient mass-production nature, without producing gap of an optical axis between each luminescence equipment.
[0020] Moreover, if the outline of the second principal plane is made into the polygon which has many angles from the outline of said rigid member, the small luminescence equipment which can carry out high density assembly will be obtained.
[0021] Moreover, if the outline of a rigid member wears R in said contact, the rate which makes a flexibility member overflow to the second principal plane is accelerated, and a rigid member can be fixed quickly. The stress applied to a flexibility member becomes strong by this, a degassing operation improves, and dependability increases. Furthermore, the flexibility member prepared in said second principal plane and the rigid member lower limit section, applying serves as a gently-sloping and flat principal plane, and a desirable appearance is acquired.
[0022] Moreover, in said first principal plane, said outcrop is characterized by being the heights projected outside the central field. By considering as such a configuration, a flexibility member can be efficiently flowed to the second principal plane and the rigid member lower limit section good. Moreover, when a flexibility member collides with said heights wall surface, a degassing operation of a flexibility member improves. If said heights have countered with the angle of said second principal plane, they can form the flexibility member which has equal thickness on the outcrop of said second principal plane, and can strengthen structural integrity. Moreover, if R wears the tip of said heights, effectiveness will increase further.
[0023] Moreover, when the lead electrode of a pair is inserted and a package is really fabricated by shaping resin from a side face, as for the inner section of said lead electrode, it is desirable to be exposed along with the outline of this first principal plane in said first principal plane. Since the front face of a lead electrode is a metal, it is thought that the fluidity of a flexibility member is excellent. Although it has high dependability by considering this invention as the configuration which is made to carry out the

collision counteraction of the flexibility member by each side attachment wall of a package, and is made to flow upwards, if a lead electrode is prepared in accordance with the side attachment wall with which said collision counteraction is performed, the collision reactionary rate of a flexibility member will be accelerated and the effectiveness of a degassing operation of air bubbles will be strengthened.
[0024] Moreover, as for the inner section of a lead electrode, it can be desirable to be dissociated and prepared in the two directions of inside from the outcrop of said first principal plane, and, thereby, it can raise the above-mentioned effectiveness further. Moreover, the omission of the really fabricated lead electrode is prevented. Moreover, when other components need to be laid, and it lays between each separation branch lead and is made to connect electrically, a protection component etc. can lay said component in the location which does not participate in a luminescence observation side, and is desirable.
[0025] Moreover, as for the inner section of a lead electrode, it is desirable to have exposed from the micropore which on the back [ a part of ] penetrated from the package tooth-back side. The stress of the lead electrode which wins popularity in case this lays the time of wirebonding being carried out and a rigid member can be softened. Thereby, the structural unification with a lead electrode and each part material can be strengthened.
[0026] Moreover, a package has the metal base with which a tooth back turns into a component side, as for the principal plane of this metal base, it is desirable that it is exposed from said crevice base and said light emitting device is laid, thereby, heat can be radiated to a mounting substrate good in the heat produced from a light emitting device, and the dependability of the flexibility member which covers a light emitting device can be raised. Moreover, the fluidity of a downward flexible member can be improved on said metal base front face, and local degradation near the light emitting device can be prevented.
[0027] Moreover, as for said metal base, it is desirable that it was inserted from the direction of a side face, and was really fabricated with said lead electrode by said shaping resin, and the end section has projected from said package side face. Thus, by constituting, a touch area with the open air of a metal base can raise the heat dissipation nature of increase and luminescence equipment.
[0028] Moreover, as for a metal base, it is desirable to have the first principal plane exposed from said crevice and the second principal plane buried in said package, and, thereby, its structural integrity of luminescence equipment improves.
[0029] moreover, the center section of the principal plane of the metal base exposed from said crevice base -- the second crevice -- preparing -- this -- if a light emitting device is laid in the second crevice base, the ejection effectiveness of the light which emits light from a light emitting device end face will improve, and also the flexibility member fluidity near the light emitting device at the time of cellular mixing prevention into a flexibility member, a degassing operation of the mixed air bubbles, and luminescence equipment use improves. Moreover, a touch area with the metal base used as a flexibility member and a heat dissipation path becomes large, and partial degradation of a flexibility member can be prevented.
[0030] Moreover, as for the end section of the lead electrode of a pair, it is more desirable than the side face in which the end section of a metal base was exposed, and the side face of the opposite side to have separated a predetermined distance and to have exposed to juxtaposition. Thereby, electrode wiring of a mounting substrate can be simplified. Moreover, luminescence equipment can be formed in a miniaturization, maintaining the tooth-back area of a metal base. Furthermore, even when there are too many conductive members prepared in the tooth back of a metal base in the tooth back of a package by preparing a notch in the side-face side of the above-mentioned opposite side, it can prevent that even the lead electrode which limits in said notch and counters flows out that said conductive member flows out in the direction of a lead electrode, and the yield improves.
[0031] Moreover, when a light emitting device has the electrode of a positive/negative pair in the same flat-surface side and the bridge is constructed over the electrode of this positive/negative pair with the inner section and the wire of a lead electrode of said pair, respectively, as for the top-most vertices of said wire, it is desirable to be arranged between said first principal plane and said second principal plane. Thus, while the fluidity of a flexibility member improves by preparing a wire, effect of the thermal stress concerning a wire can be made into the minimum. moreover -- since it does not have the failure which the lead electrode has been arranged more nearly up than each electrode of a light emitting device, and was projected upwards to the shunt of the wire from a light emitting device to a lead electrode -- a wirebonding activity -- comparatively -- easy -- and dependability -- it can carry out

highly.
[0032] Moreover, what is necessary is just to contain said fluorescent material in at least one layer, when considering as a configuration in the laminated structure which is possible also for making said flexibility member contain a fluorescent material, and consists said flexibility member of at least two or more layers.
[0033]
[Embodiment of the Invention] As a result of various experiments, when this invention person covers a light emitting device chip with a flexibility member and a rigid member, by specifying the configuration of a rigid member member, he finds out that the above-mentioned problem is solvable, and came to accomplish this invention. Hereafter, each configuration of this invention is explained in full detail.
[0034] (Package 1) In the metal mold which the metal base which serves as a forward lead electrode, the negative lead electrode 5, and a heat sink as shown in drawing 1 was inserted from the side face which countered, respectively, and was closed, from the gate in an inferior-surface-of-tongue side, a package slushes the shaping resin by which melting was carried out, hardens, and is formed.
[0035] If it explains to a detail, the package would have the first crevice in the principal plane side, and the principal plane of the metal base 6 inserted from one side face of said package will have exposed it from this crevice base. The second crevice which can contain a light emitting device is established in the principal plane of said metal base 6.
[0036] On the other hand, the first principal plane which spreads outside [ above said first crevice ], and the second principal plane which spreads outside [ above said first principal plane ] are prepared. The principal plane of the lead electrode of a positive/negative pair inserted from one side face of said package and the side face of another side which countered is exposed from said first principal plane. The principal plane of said lead electrode is electrically connected with each electrode of said light emitting device with the wire, respectively. Moreover, said second principal plane has constituted the role of positioning of the rigid member laid up.
[0037] Using the package which has such a configuration, a light emitting device is electrically connected to the crevice base of said package, these are sealed in the rigid member which is the flexibility member and the second closure member which are the first closure member, and the luminescence equipment of this invention is obtained.
[0038] As for other lead electrode principal planes, it is [ that an area required to fix each electrode of said light emitting device chip and the electric conduction wire over which a bridge is constructed has just exposed the lead electrode principal plane exposed in said first crevice here ] desirable like drawing 16 to be covered with the same ingredient as package resin. Thereby, the evaporation expansion produced in the interface of a lead electrode and the first closure member can be controlled. Moreover, from enlarging the touch area of the strong package shaping resin and the closure member of adhesion comparatively, the integrity of luminescence equipment is raised and luminescence equipment with high optical property and dependability is obtained.
[0039] The package of the gestalt of this operation here is made into the configuration where a part of said first principal plane and said second principal plane can be exposed outside from said second closure member. with the gestalt of this operation, the closure member of ** the second whose an outline it supposes that it is square and is a circle in this rectangular head which picked R in the outer wall of the second principal plane is inscribed in -- having -- this -- the both sides of the edge of said second principal plane and the edge of said first principal plane have exposed on four peripheries of the second closure member. Thus, when this invention lays a rigid member in the upper part after closing the flexibility member inside the package, it can control that air bubbles are also extruded with a flexibility member and air bubbles mix between a rigid member and a flexibility member from said path by preparing the path which was not taken up by said rigid member but was consistent from the base of a package to the upper part. With the gestalt of this operation, the degassing effectiveness of air bubbles is especially raised according to the collision counteraction by the outline of said convex configuration by considering as the convex configuration where the outcrop of said first principal plane was projected from the center section of said first principal plane. Although such a consistent path is formed by adjusting the gestalt of a package with the gestalt of this operation, it is not restricted to this and can also form by forming notching in the edge of a lens.
[0040] (Lead electrode 5) A lead electrode can be constituted using high temperature conductors, such as copper and copper containing iron. Moreover, in order to be also able to perform metal plating, such as silver, aluminum, and copper metallurgy, to the front face of a lead electrode and to raise the

reflection factor of the front face of a lead electrode for the improvement in the reflection factor of the light from a light emitting device, antioxidizing of a lead base material, etc., it is desirable to make it smooth. Moreover, if enlarging is desirable as for the area of a lead electrode and it does in this way, it can raise heat dissipation nature, and it can control effectively the temperature rise of the light emitting device chip arranged. By this, it can become possible to supply comparatively much power to a light emitting device chip, and an optical output can be raised.

[0041] A lead electrode is formed of punching processing using a press in the long metal plate which consists of a copper alloy group of for example, 0.15mm thickness. With the gestalt of this operation, press working of sheet metal has been performed so that a forward lead electrode and a negative lead electrode may stand in a row in an one direction.

[0042] As for the crossing angle of the tooth back of a lead electrode, and a side face, in the luminescence equipment of this invention, it is desirable to wear the curve. Thus, when a radius of circle is prepared in the edge of a lead electrode according to the direction which pours in resin, the flow of shaping resin becomes smooth and the adhesion of said lead electrode and the shaping resin section makes it strengthen. Moreover, you can make it filled up with resin that there is no clearance in the lead inter-electrode space of the pair exposed to the package base. Moreover, junction Rhine with the lead electrode of the shaping resin section serves as said lead electrode and the configuration where it corresponded. Therefore, if the lead electrode which has the above-mentioned configuration is used, a basic angle can make junction Rhine with said tooth back on the side face of the shaping resin section the crevice configuration which wore the curve. The stress concentration in said junction Rhine is avoided by this, and generating of a package crack can be controlled.

[0043] Furthermore, as for the crossing angle of the principal plane of a lead electrode, and a side face, rising acutely is desirable. Thereby, the adhesion of a lead electrode and the first closure member can improve, and exfoliation by these interfaces can be controlled.

[0044] Moreover, the outer lead section of the forward lead electrode projected from the outer wall of a package Plastic solid and a negative lead electrode is processed into a gull wing mold so that a tooth back may constitute the same flat surface as the tooth back of the molding resin section, and the tooth back of a metal base, and it is the connection terminal area of positive/negative. In addition, the structure of the connection terminal area of this invention may not be restricted to a gull wing mold, and may be other structures, such as J-bend (Bend).

[0045] (Metal base 6) The package used for the luminescence equipment of the gestalt of this operation has the metal base which a light emitting device is contained in the center section, and can radiate heat good in generation of heat from said light emitting device in it. Said metal base has a crevice in a principal plane side, and the tooth back is mostly located on the same flat surface with the component side of luminescence equipment, i.e., the connection terminal area tooth back of a lead electrode, and the molding resin section tooth back, and it is constituted so that a mounting substrate may be touched. Thus, by constituting, heat can be radiated to a direct mounting substrate in generation of heat from a light emitting device, the amount of current droppings to a light emitting device is increased, and improvement in an output can be aimed at. The thickness at said base of a crevice is formed in the thin film so that it may have good heat dissipation nature. As for said crevice, being located in the center section of luminescence equipment is desirable, and, thereby, good directional characteristics are acquired. Moreover, as for a crevice, it is desirable to have the volume which can contain said whole light emitting device. Thereby, the light which emits light from the four-way-type side face of a light emitting device can be taken out in the direction of a transverse plane good with said crevice wall. Moreover, when transforming the wavelength of a light emitting device using a color conversion layer, it becomes possible to cover easily with a color conversion layer said whole light emitting device arranged in said crevice. Said color conversion layer consists of a fluorescent material which a part of light which emits light from a translucency member and said light emitting device is absorbed, and can emit light in other wavelength. Since especially the metal package used for this invention is excellent in the heat dissipation nature of the crevice where a light emitting device is arranged, not only an inorganic substance but each part material of said color conversion layer can use the organic substance, degradation of said organic substance by high current dropping is hardly started, but a good optical property is obtained. moreover, so that, as for the wall of said crevice, the volume goes to an opening side -- large -- become -- it is desirable that it is a taper configuration and luminescence equipment with possible this emitting light in high brightness further is obtained.

[0046] Said crevice is constituted by performing spinning to for example, a metal plate. With the gestalt

of this operation, spinning is performed [ of a metal plate ] from a principal plane, and a sink crevice is formed in the direction of a tooth back for a metal. Thereby, it becomes the configuration which has irregularity, a touch area with the molding resin section increases, and an outline on the back can strengthen structural integrity.

[0047] As for the thermal conductivity of said lead electrode and a metal base, it is desirable respectively that it is the 10 or more W/m-K range of 100 or less W/m-K, and 15 or more W/m-K 80 or less W/m-K is 15 or more W/m-K 50 or less W/m-K still more preferably more preferably. The luminescence equipment which can carry out long duration dropping of the high current is obtained maintaining dependability.

[0048] (Light emitting device 2) Although especially the light emitting device chip used by this invention is not limited, when insert molding of the lead electrode and metal base of a pair is carried out by molding resin like the above, the light emitting device chip which has the electrode of a positive/negative pair is used for the same field side. Moreover, when a fluorescent material is used, the semi-conductor light emitting device which has the luminous layer which can emit light in the luminescence wavelength which can excite this fluorescent material is desirable. Although various semi-conductors, such as ZnSe and GaN, can be mentioned as such a semi-conductor light emitting device, the nitride semi-conductor (InXAlYGa1-X-YN, 0 <=X, 0<=Y, X+Y<=1) with which the short wavelength which can excite a fluorescent material efficiently can emit light is mentioned suitably. Moreover, it is possible to also make said nitride semi-conductor contain boron and Lynn according to a request. As structure of a semi-conductor, the thing of a terrorism configuration is mentioned to the gay structure, hetero structure, or double which has MIS junction, PIN junction, pn junction, etc. Various luminescence wavelength can be chosen by whenever [ ingredient or its mixed-crystal ]. [ of a semi-conductor layer ] Moreover, it can also consider as the single quantum well structure and multiplex quantum well structure where the semi-conductor barrier layer was made to form in the thin film which the quantum effectiveness produces. When a nitride semi-conductor is used, ingredients, such as sapphire, a spinel, and SiC, Si, ZnO, GaN, are suitably used for the substrate for semi-conductors. In order to make a crystalline good nitride semi-conductor form with sufficient mass-production nature, it is desirable to use a sapphire substrate. this sapphire substrate top -- MOCVD -- a nitride semi-conductor can be made to form using law etc. Buffer layers, such as GaN, AlN, and GaAlN, are formed on silicon on sapphire, and the nitride semi-conductor which has pn junction is made to form on it. A terrorism configuration etc. is mentioned to the double which carried out the laminating of the 1st contact layer formed by n mold gallium nitride on the buffer layer, the 1st cladding layer made to form by n mold alumimium-nitride gallium, the barrier layer formed by the indium nitride gallium, the 2nd cladding layer formed by p mold alumimium-nitride gallium, and the 2nd contact layer formed by p mold gallium nitride to order as an example of a light emitting device which has the pn junction which used the nitride semi-conductor. A nitride semi-conductor shows n mold conductivity in the condition of not doping an impurity. When making n mold nitride semi-conductor of a request, such as raising luminous efficiency, form, it is desirable to introduce Si, germanium, Se, Te, C, etc. suitably as an n mold dopant. On the other hand, when making p mold nitride semi-conductor form, Zn, Mg, Be, calcium, Sr, Ba, etc. which are p mold dopant are made to dope. Only by doping p mold dopant, since it is hard to form a nitride semi-conductor into p mold, it is desirable to make low resistance form by heating, a plasma exposure, etc. at a furnace after p mold dopant installation. Moreover, after carrying out the laminating of the metal layer on said p type layer, the substrate for semi-conductors may be removed. Thus, if the constituted light emitting device is mounted so that said metal layer may become a component-side side, the high luminescence equipment of heat dissipation nature will be obtained. The light emitting device which consists of a nitride semi-conductor can be made to form by making it cut in the shape of a chip from a semi-conductor wafer after forming each electrode on p type layer exposed, respectively and n type layer.

[0049] In the light emitting diode of this invention, in order to make a white system emit light, in consideration of complementary color relation with the luminescence wavelength from a fluorescent material, degradation of translucency resin, etc., the luminescence wavelength of a light emitting device has 400nm or more desirable 530nm or less, and 420nm or more 490nm or less is more desirable. In order to raise more excitation with a light emitting device and a fluorescent material, and luminous efficiency, respectively, 450nm or more 475nm or less is still more desirable.

[0050] in addition, the first closure member which a light emitting device chip excels [ first ] in lightfastness, and has flexibility in this invention -- dependability -- since the closure is carried out

highly, local degradation of the configuration member by the near ultraviolet ray or ultraviolet rays can be controlled. Therefore, color conversion mold luminescence equipment with little color nonuniformity is obtained by combining the fluorescent material which a part of light from said light emitting device is absorbed using the light emitting device which makes an ultraviolet-rays field shorter than 400nm the main luminescence wavelength to the luminescence equipment of this invention, and can emit light in other wavelength. Here, in case the binder of said fluorescent material is carried out to a light emitting device chip, it is desirable to use the glass which is resin comparatively strong against ultraviolet rays and an inorganic substance.

[0051] Here, a light emitting device is a gallium nitride system compound semiconductor element which can emit light for blue, and n electrode is formed on n type layer in which the nitride semi-conductor layer containing n type layer, a barrier layer, and p type layer is formed for example, on silicon on sapphire, and this component removes and exposed a part of barrier layer and p type layer, and it comes to form p electrode on p type layer.

[0052] (Flexibility member 3) It applies to the upper rigid member lower limit section out of the crevice of a package, and the flexibility member is prepared so that said light emitting device may be covered. Said flexibility member can protect a light emitting device from moisture etc., and also has translucency and can take out the light from a light emitting device outside efficiently. Moreover, since it has high stability to heat, the thermal stress produced at the time of actuation of luminescence equipment can be made to ease. Moreover, when the light emitting device of a near-ultraviolet field or an ultraviolet region is used, it is desirable to use the flexibility member which was excellent in lightfastness to such light. As a member which has these flexibility, rubber-like elasticity resin, gel resin, etc. are mentioned. Or these resin has low crosslinking density, it can have good flexibility from not having the structure of cross linkage. Moreover, in order to give the specific screen effect etc. to the light from a light emitting device chip, a coloring color and a color pigment can also be added.

[0053] (Rigid member 4) In the luminescence equipment of this invention, the closure of the flexibility member prepared in the perimeter of a light emitting device is carried out in the rigid member. The rigid member used for this invention has a mechanical strength, and especially if it is translucency, it will not be limited.

[0054] In the gestalt of this operation, the rigid member which is said optical ejection window part is located in the top face of the light emitting device arranged in the crevice of said metal package, and serves as a field where the interior of the production of the wall of said crevice and an intersection participates in luminescence. Reflective dispersion is carried out on the side face of said crevice in said flexibility member, and the light which emits light from the edge of a light emitting device passes a rigid member, and is taken out in the direction of a transverse plane. It is thought that the these reflective scattered lights' existence range is in the production of the side face of said crevice mostly. Then, the luminescence equipment which can emit light in the brightness considered as a request is obtained by adjusting the configuration inside said intersection to all configurations. Moreover, as for the base material of a rigid member, it is desirable that the molding resin which forms a package body and the flexibility member prepared in the lower part, and the coefficient of thermal expansion approximate.

[0055] As for the configuration of a rigid member, it is desirable to have one continuous tooth back. without air bubbles are mixed in an interface with a flexibility member by this -- dependability -- it becomes possible to install highly. moreover -- if a edge is established in a periphery on the back -- further -- reliance -- it can install highly.

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EXAMPLE

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[Example] Hereafter, the luminescence equipment of the example concerning this invention is explained in full detail. In addition, this invention is not limited only to the example shown below.
[0082] (Example 1) The luminescence equipment of a surface mount mold as shown in drawing 1 is formed. An LED chip uses the nitride semiconductor device which has the In0.2Ga0.8N semi-conductor which is 475nm whose monochromatic luminescence peaks are the light as a luminous layer. the sapphire substrate top which made the LED chip more specifically wash -- TMG (trimethylgallium) gas, TMI (trimethylindium) gas, nitrogen gas, and dopant gas -- carrier gas -- a sink and MOCVD -- it can be made to form by making a nitride semi-conductor form by law The layer used as n mold nitride semi-conductor or p mold nitride semi-conductor is made to form by changing Cp2Mg to SiH4 as dopant gas.
[0083] The n mold GaN layer which is the nitride semi-conductor of undoping on silicon on sapphire as component structure of an LED chip, The GaN layer which n mold electrode of Si dope is formed and turns into n mold contact layer, It has considered as the multiplex quantum well structure to which the five-layer laminating of the InGaN layer which made one set the n mold GaN layer which is the nitride semi-conductor of undoping, the GaN layer used as the barrier layer which constitutes a luminous layer next, the InGaN layer which constitutes a well layer, and the GaN layer used as a barrier layer, and was pinched by the GaN layer was carried out. On the luminous layer, it has considered as the configuration to which the laminating of an AlGaN layer and the GaN layer which is p mold contact layer by which Mg was doped was carried out one by one as a p mold cladding layer by which Mg was doped. (In addition, a GaN layer is made to form at low temperature on a sapphire substrate, and it has considered as the buffer layer.) Moreover, annealing of the p type semiconductor has been carried out above 400 degrees C after membrane formation.
[0084] pn each contact layer front face is exposed to the nitride semi-conductor on silicon on sapphire by the same side side by etching. The sputtering method is used and positive/negative each plinth electrode is made to form on each contact layer, respectively. In addition, after making a metal thin film form as a translucency electrode the whole surface on p mold nitride semi-conductor, the plinth electrode is made to have formed in some translucency electrodes. After lengthening a scribe line, external force is made to divide the done semi-conductor wafer, and the LED chip which is a semi-conductor light emitting device is made to form.
[0085] On the other hand, it is processed by piercing to the first copper plate of 0.3mm thickness, and two or more lead electrodes of the pair which stood in a row in the direction on the other hand are formed. Next, it pierces to the second copper plate of 1.2mm thickness which consists of thickness thicker than said first copper plate, processing and press working of sheet metal are performed, and two or more metal bases which have the crevice which can contain a light emitting device chip in a principal plane side are formed. The lead electrode and said metal base of said pair are inserted from the direction which counters, respectively, and it arranges in metal metal mold so that each lead electrode may become symmetrical through said metal base in the upper part of said metal base. Under the present circumstances, the inner point of each lead electrode is being fixed with the base material from the lower part.
[0086] Thus, said first copper plate installed in metal mold and said second copper plate are really fabricated with molding resin, and a package is created. Thus, the obtained package has the first principal plane which spreads outside in the upper part of the first crevice which the crevice of said metal base exposes to a principal plane side, and this first crevice, and the second principal plane which spreads outside in the upper part of this first principal plane. The outline of said second principal plane

is the square by which chamfering was carried out, and the corner of said first principal plane prepares a lobe toward the corner of said second principal plane, respectively. When a rigid member is laid up, said lobe is constituted so that it may expose to this rigid member exterior.
[0087] Next, die bond of the LED chip is carried out with an Ag-Sn alloy into the crevice established in said metal base. Resin or glass etc. which the conductive ingredient besides the above alloys contained can be used for the joint material used for die bond here. If the conductive ingredient to contain has desirable Ag and Ag paste whose content is 80% - 90% is used, it will excel in heat dissipation nature, and luminescence equipment with the small stress after junction will be obtained. Moreover, when a metal layer is prepared in the substrate side of a light emitting device and it fixes, heat dissipation nature and optical ejection effectiveness improve and are desirable.
[0088] Next, an electric flow is taken for each electrode of the LED chip by which die bond was carried out, and each lead electrode exposed from the package crevice base with Ag wire, respectively. When not using resin for a configuration member here, it is also possible to use aluminum wire.
[0089] Next, gel silicone resin is poured in by potting, and continuously, on said gel silicone resin, the lens which consists of glass as a translucency rigidity member is pushed caudad, and is laid so that the second principal plane may be covered from said crevice. Said lens can consist of thermoplastics, glass, etc. which are a plastic here. Moreover, it has one continuous tooth back and has the curved surface projected caudad. Moreover, it has the edge where a tooth back is parallel to said second principal plane in the periphery section. Furthermore, the outline of said edge has accomplished the round shape so that it may be inscribed in the outline of said second principal plane. After making some downward gel silicone resin overflow to the top face of said edge from the lobe of said first principal plane which installed the lens constituted by this like on said second principal plane, and was exposed from the outside of said lens, Under 100-degree-C temperature, under 150 more degree-C temperature, it heats and the structural unification of each part material is carried out under 70-degree-C temperature for 2 hours for 2 hours for 2 hours.
[0090] Thus, the obtained luminescence equipment does not have contaminants, such as air bubbles, but has the outstanding dependability and the outstanding optical property.
[0091] (Example 2) if luminescence equipment is formed like an example 1 except the outline of said second principal plane being the hexagon by which chamfering was carried out like drawing 10 -- an example 1 -- mass-production nature -- excelling -- and a consistency -- the luminescence equipment which can be mounted highly is obtained.
[0092] (Example 3) Like drawing 11 , the outline of said second principal plane and the outline of said first principal plane are polygons which are similar, respectively, and except a lens having notching in the periphery section so that the angle of said first principal plane may be exposed, if luminescence equipment is formed like an example 1, the same effectiveness as an example 1 will be acquired.
[0093] (Example 4) Except making into a convex lens configuration the lens used as a rigid member, if luminescence equipment is formed like an example 3, transverse-plane luminous intensity will improve 50% from an example 1.
[0094] (Example 5) In a lens, luminescence equipment is formed like an example 1 except making a fluorescent material contain beforehand.
[0095] A fluorescent material carries out coprecipitation of the solution which dissolved the rare earth elements of Y, Gd, and Ce in the acid by stoichiometry with oxalic acid here. This is mixed with the coprecipitation oxide calcinated and obtained and an aluminum oxide, and a mixed raw material is obtained. Barium fluoride is mixed as flux to this, crucible is stuffed, it calcinates at the temperature of 1400-degreeC in air for 3 hours, and a burned product can be obtained. The ball mill of the burned product is carried out underwater, and 2.750aluminum5O12:Ce0.250 fluorescent material whose diameter of a centriole is 22 micrometers (Y0.995Gd0.005) is formed in washing, separation, desiccation, and the last through a screen.
[0096] Thus, the obtained fluorescent material and a powder-like silica are mixed at a rate of 1:2, with metal mold, melting hardening is carried out and package molding is carried out. Thus, the effectiveness as an example 1 with the obtained same color conversion mold luminescence equipment is acquired, and it is reliable and it can emit light in the white light by high power.
[0097] (Example 6) the slurry which consists of nitrocellulose 90wt% and gamma-alumina 10wt% -- receiving -- the above-mentioned fluorescent material -- 50wt(s)% -- it is made to contain and applies to the tooth back of a rigid member, and except constituting a color conversion member by carrying out heat hardening for 30 minutes at 220 degrees C, if luminescence equipment is formed like an example 5,

the same effectiveness as an example 5 will be acquired.
[0098] (Example 7) Except laying a lens, after applying elastic silicone resin for said light emitting device on said gel silicone resin, if luminescence equipment is formed like an example 1, the adhesion of a lens will improve and still more reliable luminescence equipment will be obtained from an example 1.
[0099] (Example 8) the inside of said gel silicone resin -- the above-mentioned fluorescent material -- 50wt(s)% -- except making it contain, if luminescence equipment is formed like an example 7, the same effectiveness as an example 5 will be acquired.
[0100] (Example 9) said light emitting device -- the above-mentioned fluorescent material -- 50wt(s)% -- except closing beforehand with the contained silica gel, if luminescence equipment is formed like an example 1, the same effectiveness as an example 5 will be acquired.
[0101] (Example 10) Luminescence equipment is formed like an example 1 except forming the continuous color conversion layer which has the above-mentioned fluorescent material and SiO2 for the front face of said light emitting device by spray coating. Here, the formation approach of said color conversion layer is explained in full detail.
[0102] although methyl silicate, ethyl silicate, N-propyl silicate, and N-butyl silicate ** can be used as process 1. alkyl silicate -- this example -- SiO2 -- 40wt(s)% -- the transparent and colorless oligomer liquid to which condensation of the included ethyl silicate was carried out is used. Moreover, what made it react with water and carried out lifting solation of the hydrolysis reaction under catalyst existence beforehand is used for ethyl silicate.
[0103] First, a weight ratio agitates the solution mixed at a rate of 1:1:1, and sol-like ethyl silicate, ethylene glycol, and a fluorescent material adjust coating liquid. Here, since it is easy to dry, as for sol-like ethyl silicate, it is desirable by mixing with the organic solvent of a high-boiling point (100 degrees C - 200 degrees C) like a butanol and ethylene glycol to prevent gelation. Thus, if it mixes with the organic solvent of a high-boiling point, the blinding of the nozzle point by gelation of sol-like ethyl silicate can be prevented, and working efficiency can be raised.
[0104] The process 2. above-mentioned coating liquid is put into a container, and coating liquid is conveyed for a nozzle from a container with a circulating pump. The flow rate of coating liquid is adjusted by the bulb. Here, the coating liquid of the shape of a fog which blows off from a nozzle is fog-like, and is characterized by being sprayed rotating spirally. Near a nozzle, specifically, it spreads in the shape of a cylinder as spraying separates from breadth and a nozzle in the shape of a cone. Thickness can cover the top face of a light emitting device, a side face, and all the corners by this in the continuous color conversion layer which homogeneity distributes and a fluorescent material becomes almost equally, and the irregular color of a blue ring etc. can be improved. Moreover, as for said color conversion layer, consisting of 1 particle layer is desirable, and, thereby, its ejection effectiveness of light improves. In this example, the distance from the top face of a light emitting device to a nozzle lower limit is installed so that spraying may come in the shape of a cylinder and the front face of a light emitting device may come to the place of an extended state as 40-50mm, and the color conversion layer which has coating liquid and gas and continued the top face of a light emitting device, a side face and an angle, and the almost more uniform still thickness on a crevice Uchihira side is formed.
[0105] Moreover, the above-mentioned process is characterized by carrying out, where the location to apply is warmed. Thereby, the ethanol generated by solation of ethyl silicate and a solvent can be flown in the instant sprayed on the light emitting device. Thereby, a color conversion layer can be prepared, without having a bad influence to a light emitting device. In this example, spray coating is carried out laying a package on a heater, and, as for the temperature of said heater, it is desirable to be adjusted to 50-degree-C or more temperature of 300 degrees C or less.
[0106] If it is left at a room temperature after performing the process 3. process 2, sol-like ethyl silicate and the moisture in air will react, and a fluorescent material will fix by SiO2.
[0107] It is made to dry at process 4., next the temperature of 300 degrees C for 2 hours. If a nitride system light emitting device is put on the bottom of the temperature of 350 degrees C or more, since the engine performance as a light emitting device will fall, the alkyl silicate in which fixing to a light emitting device front face is possible can be preferably used as a binder of a fluorescent material under the temperature which is 300 degrees C.
[0108] Since all consist of inorganic substances, the luminescence equipment constituted as mentioned above is excellent also in the lightfastness over near-ultraviolet or ultraviolet rays while having it with high heat dissipation nature. All components, such as a light emitting device which emits light in an

ultraviolet region, can be used for the luminescence equipment of this example.
[0109] (Example 11) Except using what carried out mixed distribution of first fluorescent material (Y0.995Gd0.005) 2.750aluminum5O12:Ce0.250 and second fluorescent material calcium1.8Eu0.2Si5N8 as a fluorescent material, if luminescence equipment is formed like an example 8, the luminescence equipment which excelled the example 8 in color rendering properties will be obtained. Although said especially second fluorescent material that can be used by this example is not limited MxSiyNz:Eu [ said the first fluorescent material and excitation wavelength are similar, and ] which can emit light in red fluorescence from yellow (-- however, the light which has the outstanding color rendering properties of the alkaline earth metal chosen from the group of calcium, Sr, Ba, and Zn is obtained, and M is desirable, when a kind and z=(2/3)x+(4/3) y) are used at least.
[0110] Specifically, said fluorescent substance is L-M-N:R or L-M-O-N:R (L contains one or more sorts chosen from the group which consists of Be, Mg, calcium, Sr, Ba, and Zn.). M contains one or more sorts chosen from the group which consists of C, Si, germanium, Sn, Ti, Zr, and Hf. N is nitrogen. O is oxygen. R is rare earth elements -- nitride system fluorescent substance ** expressed -- desirable -- further -- LxMyN{(2/3) x+(4/3) y}:R or LxMyOzN{(2/3) x+(4/3) y-(2/3) z}:R (L contains one or more sorts chosen from the group which consists of Be, Mg, calcium, Sr, Ba, and Zn.) M contains one or more sorts chosen from the group which consists of C, Si, germanium, Sn, Ti, Zr, and Hf. N is nitrogen. O is oxygen. R is rare earth elements. It is desirable that it is the nitride system fluorescent substance which is expressed and has the crystal structure. The luminescence equipment with which the white of a warm color system can emit light is obtained by using such a fluorescent substance.
[0111] calcium2Si5O0.1N7.9:Eu by which Mu and B were added when the example of a basic configuration element was given concretely, Sr2Si5O0.1N7.9:Eu, 2(CaaSr1-a) Si5O0.1N7.9:Eu, There are CaSi7O0.5N9.5:Eu, calcium2Si5O0.5N7.9:Eu by which rare earth was added further, Sr2Si5O0.5N7.7:Eu, 2(CaaSr1-a) Si5O0.1N7.9:Eu, etc.
[0112] further -- Sr2Si5N8: -- Eu, Pr, and Ba2Si5N8: -- Eu and Pr -- Mg2Si5N8: -- Eu, Pr, and Zn2Si5N8: -- Eu, Pr, and SrSi7N10: -- Eu and Pr -- It Eu(s) and Ce(s). BaSi7N10: -- Eu, Ce, and MgSi7N10: -- Eu, Ce, and ZnSi7N10: -- Sr2germanium5N8: -- Eu, Ce, and Ba2germanium5N8: -- Eu, Pr, and Mg2germanium5N8: -- Eu and Pr -- Zn2germanium5N8: -- Eu, Pr, and SrGe7N10: -- Eu, Ce, and BaGe7N10: -- Eu and Pr -- MgGe7N10: -- Eu, Pr, and ZnGe7N10: -- Eu, Ce, and Sr1.8calcium0.2Si5N8: -- Eu and Pr -- Ba1.8calcium0.2Si5N8: -- Eu, Ce, and Mg1.8calcium0.2Si5N8: -- Eu and Pr -- It Eu(s) and La(s). Zn1.8calcium0.2Si5N8: -- Eu, Ce, and Sr0.8calcium0.2Si7N10: -- It Eu(s) and Nd(s). Ba0.8calcium0.2Si7N10: -- Eu, La, and Mg0.8calcium0.2Si7N10: -- Zn0.8calcium0.2Si7N10: -- Eu, Nd, and Sr0.8calcium0.2germanium7N10: -- Eu and Tb -- Ba0.8calcium0.2germanium7N10: -- Eu, Tb, and Mg0.8calcium0.2germanium7N10: -- Eu and Pr --

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CLAIMS

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[Claim(s)]
[Claim 1] It is luminescence equipment which it is luminescence equipment which has a light emitting device chip, the translucency flexible member which covers this light emitting device chip, and the translucency rigidity member laid above this flexibility member, and said translucency member has a principal plane and a tooth back, and is characterized by having projected said tooth back in said direction of a light emitting device.
[Claim 2] Said tooth back is luminescence equipment according to claim 1 characterized by being close in one point a light emitting device chip and recently [ said ].
[Claim 3] Said tooth back is luminescence equipment according to claim 1 characterized by having a curved surface.
[Claim 4] Said tooth back is luminescence equipment according to claim 1 characterized by being a convex configuration.
[Claim 5] It is luminescence equipment according to claim 1 which the lower limit of said rigid member has the flange which spreads outside, and is characterized by covering the side face and principal plane of this flange with said flexibility member.
[Claim 6] The package which contains a light emitting device chip in the crevice established in the front face, It is luminescence equipment which has the flexibility member which covers said crevice at least and has translucency, and the rigid member which is laid above this flexibility member and has translucency. Said package The first principal plane which spreads toward an outside in said first crevice upper part at least, It has the second principal plane which spreads outside from this first principal plane in the upper part, and the third principal plane which serves as the exterior of a breadth package from this second principal plane outside in the upper part. Said rigid member In the outline of said second principal plane, it has at least three or more contacts, and is inscribed in. Said the first principal plane and said second principal plane It is luminescence equipment which has an outcrop in each exterior between contacts of the ******** aforementioned rigidity member, and is characterized by preparing said flexibility member continuously over said first principal plane, said second principal plane, and the lower limit section of said rigid member.
[Claim 7] Said second principal plane is luminescence equipment according to claim 1 characterized by being continuously prepared over said first principal plane and the lower limit section of said rigid member.
[Claim 8] It is luminescence equipment according to claim 6 which said rigid member has at least three or more contacts, is inscribed in in the outline of said second principal plane, and is characterized by said the first principal plane and said second principal plane having an outcrop in each exterior between contacts of said rigid member, respectively.
[Claim 9] It is luminescence equipment according to claim 6 which the lower limit of said rigid member has the flange which spreads outside, and is characterized by covering the side face and principal plane of this flange with said flexibility member.
[Claim 10] The tooth back of said flange is luminescence equipment according to claim 9 characterized by being parallel to said second principal plane, and having countered.
[Claim 11] The outline of said second principal plane is luminescence equipment according to claim 8 characterized by being the polygon which has many angles from the outline of said rigid member.
[Claim 12] The outline of said rigid member is luminescence equipment according to claim 11 characterized by wearing R in said contact.

[Claim 13] It is luminescence equipment according to claim 8 characterized by being the heights which projected said outcrop outside the central field in said first principal plane.
[Claim 14] It is luminescence equipment according to claim 8 characterized by said outcrop having countered with the angle of said second principal plane in said first principal plane.
[Claim 15] It is luminescence equipment according to claim 8 characterized by the outline at said tip of an outcrop wearing R in said first principal plane.
[Claim 16] It is luminescence equipment according to claim 6 which the lead electrode of a pair is inserted from a side face, and said package is really fabricated by shaping resin, and is characterized by exposing the inner section of said lead electrode along with the outline of this first principal plane in said first principal plane.
[Claim 17] the inner section of said lead electrode -- from the outcrop of said first principal plane -- since -- the luminescence equipment according to claim 16 characterized by having dissociated in the two directions of inside.
[Claim 18] The inner section of said lead electrode is luminescence equipment according to claim 16 characterized by having exposed from the micropore which on the back [ a part of ] penetrated from the package tooth-back side.
[Claim 19] It is luminescence equipment according to claim 6 characterized by for said package having the metal base with which a tooth back turns into a component side, exposing the principal plane of this metal base from said crevice base, and laying said light emitting device.
[Claim 20] Said metal base is luminescence equipment according to claim 19 characterized by being inserted from the direction of a side face and really being fabricated with said lead electrode by said shaping resin.
[Claim 21] Said metal base is luminescence equipment according to claim 19 to 16 characterized by having the first principal plane exposed from said crevice, and the second principal plane buried into said package.
[Claim 22] Said metal base is luminescence equipment according to claim 19 characterized by having the second crevice in the center section of the principal plane of a metal base from said crevice base.
[Claim 23] The end section of the lead electrode of said pair is luminescence equipment according to claim 19 characterized by having separated a predetermined distance and having exposed to juxtaposition from the side face in which the end section of said metal base was exposed, and the side face of the opposite side.
[Claim 24] The tooth back of said package is luminescence equipment according to claim 19 characterized by having the notch which carried out opening at the above-mentioned metal base and side-face side which counters.
[Claim 25] It is luminescence equipment according to claim 6 which said light emitting device has the electrode of a positive/negative pair in the same flat-surface side, and the electrode of this positive/negative pair has the inner section of the lead electrode of said pair, and the wire which constructed the bridge, respectively, and is characterized by arranging the top-most vertices of this wire between said first principal plane and said second principal plane.
[Claim 26] Said flexibility member is luminescence equipment according to claim 1 characterized by the fluorescent material containing.
[Claim 27] It is luminescence equipment according to claim 26 which said flexibility member has the laminated structure which consists of at least two or more layers, and is characterized by containing said fluorescent material in at least one layer.
[Claim 28] The package which contains a light emitting device chip in the crevice established in the front face, Cover said crevice at least and it has a translucency flexible member and the rigid member which is laid above this flexibility member and has translucency. The first process which pours in said translucency flexible member so that said light emitting device may be covered in the package which is the formation approach of luminescence equipment equipped with the path which was consistent from the base of said package to the upper part, and has a crevice on a front face, The formation approach of luminescence equipment of having the second process which said rigid member is caudad forced [ process ] on said translucency flexibility member, and makes said translucency flexibility member overflowing from said path to the edge top face of said translucency rigidity member, and the third process which it heats [ process ] and carries out the structural unification of each configuration member.

[Translation done.]